ROHDE&SCHWARZ

DOCUMENTATION

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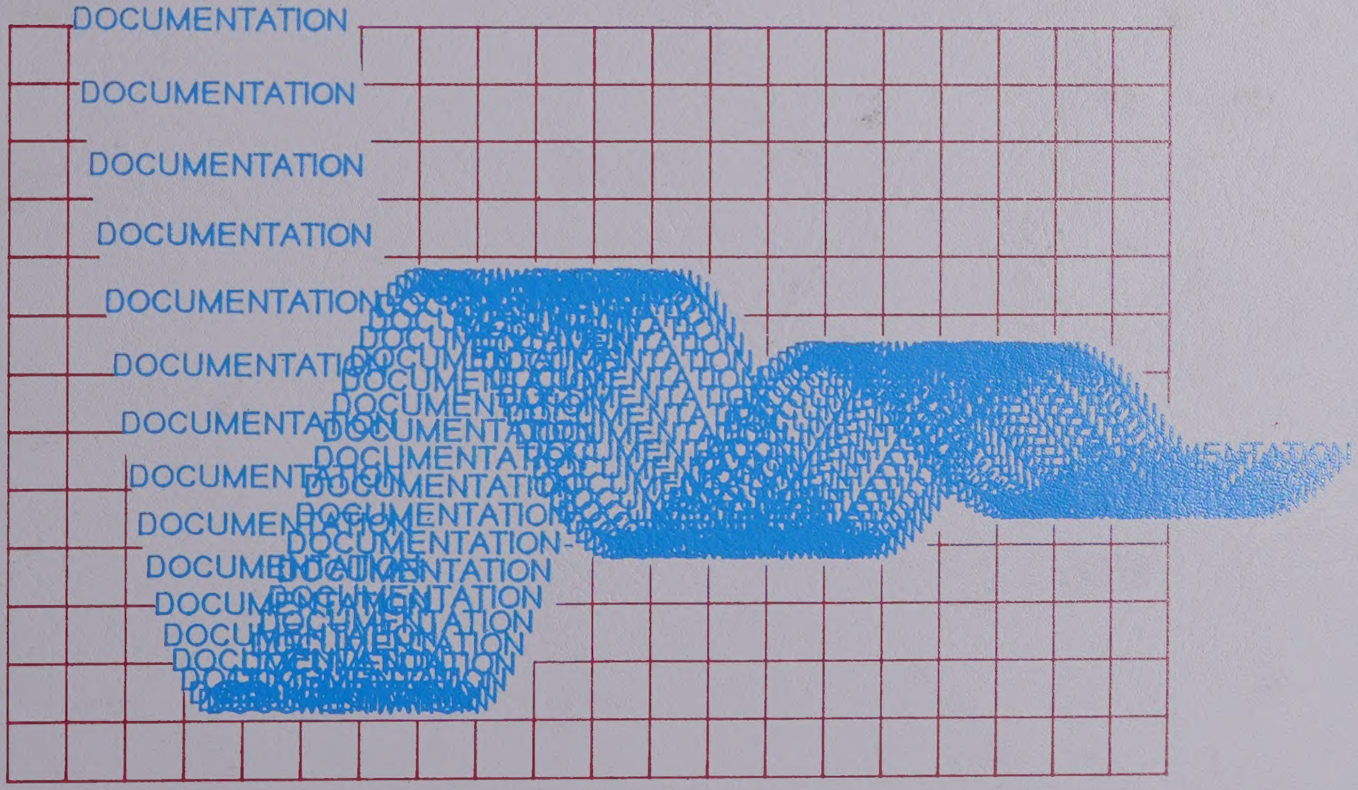


Contents

2 Getting Started **2.1**
Connecting a Mobile Phone **2.2**
Non-Signalling Mode **2.7**
Signalling Mode **2.11**
Call Setup and Signalling Parameters 2.11
Power Measurements 2.19
Modulation Measurements 2.25

2 Getting Started

This chapter provides examples of using the CMU Universal Radio Communication Tester to perform tests on an IMT-2000 mobile station (CDMA2000). It is intended to provide a quick overview of the CDMA2000 function groups *Non-Signalling* and *Signalling* and their functionality.

NOTE: The tests and screen shots provided in the manual are based on the CDMA2000 450 *function group.*

Before starting any measurements with the CMU, please note the instructions given in Chapter 1 of the CMU Operating manual for putting the instrument into operation. Chapters 2 through 4 of the CMU Operating manual contain information on customizing the instrument and display according to your personal preferences. For instructions about activating the CDMA2000 option, refer to Chapter 1 of this manual.

The procedures in this chapter include:

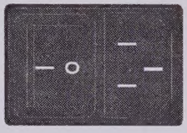
- Analyzer/Generator operation in *Non-Signalling* mode,
- Connection of the phone and selection of signalling parameters
- Power and modulation measurements in *Signalling* mode.

The left side of each double column page illustrates the steps and results obtained on the CMU screen. The right column of the page provides additional information on each step. If available, alternative settings and related measurements are provided.

Manual operation principles are discussed in Chapter 3. All menus, functions, and parameters (including CDMA background information) are discussed in Chapter 4.

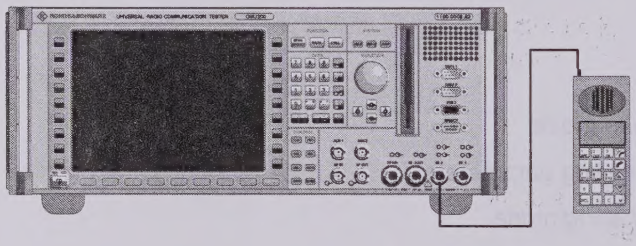
Connecting a Mobile Phone

This chapter describes how to use the CMU to perform CDMA2000 mobile phone tests. Prior to starting any tests, the CMU must be correctly set up and connected to the AC power supply as described in the CMU operating manual. The CDMA option must be enabled as described in chapter 1 of this manual.



Step 1

- Switch on the CMU using the mains switch on the rear panel.
- Check the status of the *ON/STANDBY* key on the front panel. The yellow LED should be illuminated indicating the CMU is in the standby operating mode.



Step 2

- Connect the bi-directional RF connector RF 2 of the CMU to the antenna connector of the mobile phone (operating in the CDMA cellular network).
- Supply the mobile phone with the correct operating voltage (battery or power supply).
- Turn the mobile phone on.

Additional Information...

... on Step 1

Mains switch on the rear panel

When the mains switch at the rear is set to *OFF*, the instrument is disconnected from the power supply. When the mains switch is set to *ON*, the instrument is in standby mode or in operation, depending on the *ON/STANDBY* key.

ON/STANDBY key on the front panel

The *ON/STANDBY* key determines whether the instrument is in standby mode or in operation.

Standby mode:

Only the reference frequency oscillator is supplied with operating voltage, and the orange LED (STANDBY) is illuminated.

Operation:

The green LED (ON) is illuminated and all modules of the instrument are supplied with operating voltage.

... on Step 2

RF connection of the mobile phone

A high-quality cable should be used for this connection, ideally with an attenuation of less than 0.5 dB.

Input and output connectors can be selected in the *Ext.Att.* tab of the *Connect. Control* menu.

Ensure that the attenuation of any antenna coupler and/or cables used is being taken into account by the CMU. During the test, the mobile receiver is being tested with very low RF signal levels, and even a small attenuation can cause the CMU to show a fail indication.

An external signal from a real network may interfere with the signal sent from the CMU to the mobile. The tests should ideally be performed in a shielded room, however, if this is not possible, the channel(s) used for the test should be changed. If different results are obtained on neighboring channels, the problem is likely to be due to external interference.

Alternative Settings and Measurements

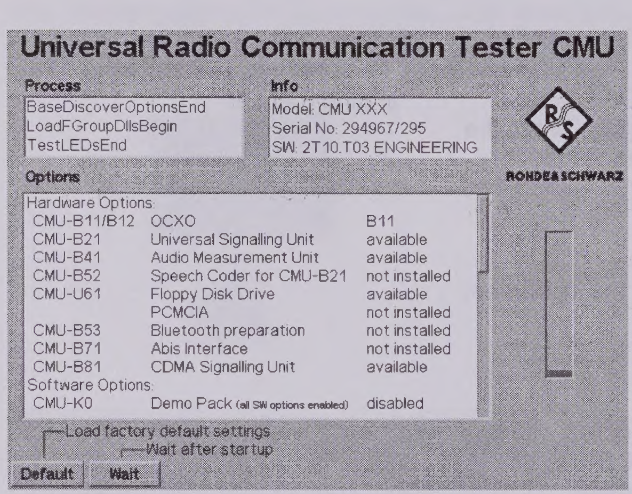
☞ Chapter 1 of the CMU operating manual

The CMU provides two bidirectional RF connectors (RF1 and RF2) differing by their input and output levels. RF2 is the recommended connector for CDMA mobile phones.

The unidirectional connectors RF4 IN and RF3 OUT are intended for connecting modules requiring high input levels or modules with low RF output levels. RF4 IN and RF3 OUT can also be used to connect CDMA mobiles off the air via antennas.

Step 3

- Press the *ON/STANDBY* front panel key on the CMU.


Universal Radio Communication Tester CMU
Process
Info
Options
ROHDE&SCHWARZ
Load factory default settings
Wait after startup
Default
Wait

BaseDiscoverOptionsEnd
LoadFGroupDllsBegin
TestLEDsEnd

Model: CMU XXX
Serial No: 294967/295
SW: 2T10.T03 ENGINEERING

Hardware Options:

CMU-B11/B12	OCXO	B11
CMU-B21	Universal Signalling Unit	available
CMU-B41	Audio Measurement Unit	available
CMU-B52	Speech Coder for CMU-B21	not installed
CMU-U61	Floppy Disk Drive	available
	PCMCIA	not installed
CMU-B53	Bluetooth preparation	not installed
CMU-B71	Abis Interface	not installed
CMU-B81	CDMA Signalling Unit	available

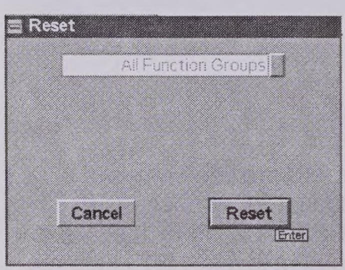
Software Options:

CMU-K0	Demo Pack (all SW options enabled)	disabled

The startup menu displays while the CMU performs the power-up tests.

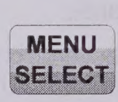
After the power-up tests are complete, the CMU returns to the last menu used in the previous session.

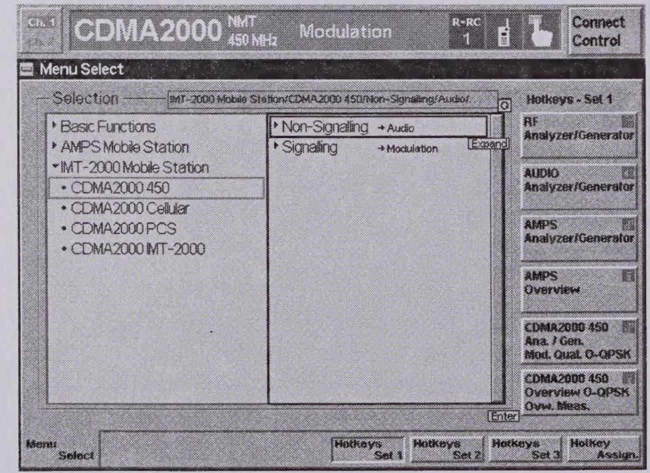
Step 4


Reset
All Function Groups
Cancel
Reset
Enter

- Press the *RESET* key to open the *Reset* popup menu.
- Use the left and right arrow keys to toggle between Cancel and Reset.
- Select *Reset* and press the *ENTER* key.
- Select *Yes* in the confirmation popup window to confirm the instrument reset.

Step 5


MENU
SELECT


Ch. 1
CDMA2000
NMT
450 MHz
Modulation
R-RC
1
Connect
Control
Menu Select
Selection
Basic Functions
AMPS Mobile Station
IMT-2000 Mobile Station
• CDMA2000 450
• CDMA2000 Cellular
• CDMA2000 PCS
• CDMA2000 IMT-2000
Non-Signalling → Audio
Signaling → Modulation
Expand
Enter
Hotkeys - Set 1
RF Analyzer/Generator
AUDIO Analyzer/Generator
AMPS Analyzer/Generator
AMPS Overview
CDMA2000 450 Ana. / Gen. Mod. Qual. O-QPSK
CDMA2000 450 Overview O-QPSK Ovw. Meas.
Menu Select
Hotkeys Set 1
Hotkeys Set 2
Hotkeys Set 3
Hotkey Assign.

Selection: IMT-2000 Mobile Station/CDMA2000 450/Non-Signaling/Audio/

- Press the *Menu Select* key to open the *Menu Select* menu.

The *Menu Select* menu indicates the function groups available. If a function group is selected, the corresponding modes and measurement menus are indicated.

From this menu, you can choose to operate in either the Non-Signalling mode or the Signalling mode.

The remainder of the chapter is divided into each of these modes.

Additional Information...

... on Step 3

Startup menu

The startup menu displays the following information:

- the status of the startup test *(Process),*
- the device name, serial number and software version *(Info),*
- the options and equipment installed *(Options),*
- the progress of the startup test (*Startup* bar graph).

Before starting a measurement, a reset is recommended to put the CMU in a known operating mode.

... on Step 4

The CMU indicates that it performs a general reset of all device settings. After finishing, the CMU is ready to carry out the remaining steps. The *Reset* popup menu closes automatically..

... on Step 5

Menu Select menu

The *Menu Select* menu shows all function groups installed and enabled on the CMU. Each of the the function groups under the IMT-2000 Mobile Station function group is subdivided in the two measurement modes *Non-Signalling* and *Signalling*, each containing measurement menus.

Alternative Settings and Measurements

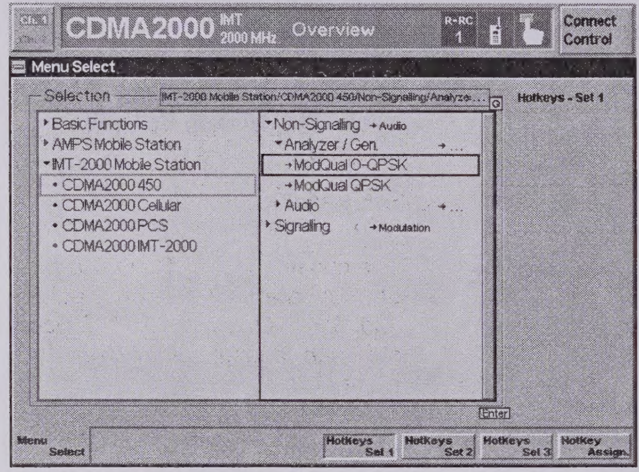
☞ Chapter 4 of CMU operating manual

Chapter 4 also contains information on customizing the CMU.

☞ Chapter 3

Non-Signalling Mode

In the *Non-Signalling* mode, a specific RF signal can be generated and an RF signal with CDMA characteristics analyzed. Without signalling, the measurements are restricted to the specified channel but without frequency restrictions.


CDMA2000 IMT 2000 MHz
Overview
R-RC 1
Connect Control
Menu Select
Hotkeys - Set 1
Enter
Menu Select
Hotkeys Set 1
Hotkeys Set 2
Hotkeys Set 3
Hotkey Assign.

Selection: IMT-2000 Mobile Station/CDMA2000 450/Non-Signaling/Analyze…

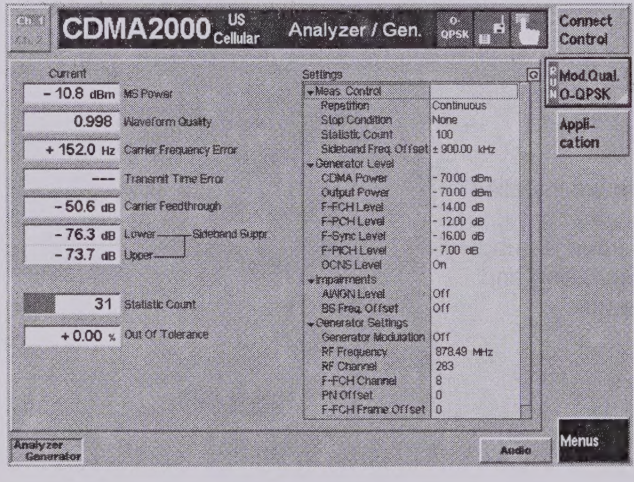
- Basic Functions
- AMPS Mobile Station
- IMT-2000 Mobile Station
  - CDMA2000 450
  - CDMA2000 Cellular
  - CDMA2000 PCS
  - CDMA2000 IMT-2000

- Non-Signaling → Audio
  - Analyzer / Gen. → …
    - → ModQual O-QPSK
    - → ModQual QPSK
  - Audio → …
- Signaling → Modulation

Step 1

- Select the CDMA2000 450 Function mode.
- Select the Non-Signalling mode and expand the list.
- Scroll down to Analyzer/Generator and expand the list.
- Scroll down to ModQual O-QPSK and press ENTER.

This displays the Analyzer/Generator screen and starts the O-QPSK modulation quality measurement.


CDMA2000 US Cellular
Analyzer / Gen.
O-QPSK
Connect Control
Mod.Qual. O-QPSK
Appli-cation
Analyzer Generator
Audio
Menus

Current

- 10.8 dBm	MS Power
0.998	Waveform Quality
+ 152.0 Hz	Carrier Frequency Error
---	Transmit Time Error
- 50.6 dB	Carrier Feedthrough
- 76.3 dB	Lower — Sideband Suppr
- 73.7 dB	Upper
31	Statistic Count
+ 0.00 %	Out Of Tolerance

Settings

Meas. Control	
Repetition	Continuous
Stop Condition	None
Statistic Count	100
Sideband Freq. Offset	± 900.00 kHz
Generator Level	
CDMA Power	- 70.00 dBm
Output Power	- 70.00 dBm
F-FCH Level	- 14.00 dB
F-PCH Level	- 12.00 dB
F-Sync Level	- 16.00 dB
F-PICH Level	- 7.00 dB
OCNS Level	On
Impairments	
AWGN Level	Off
BS Freq. Offset	Off
Generator Settings	
Generator Modulation	Off
RF Frequency	878.49 MHz
RF Channel	283
F-FCH Channel	8
PN Offset	0
F-FCH Frame Offset	0

Step 2

The *Analyzer/Generator* screen displays the current measurements and the RF generator and analyzer settings of the CMU.

The current measurement results for power and modulation of the received signal are displayed. Output fields displaying "---" indicates that no valid measurement results are available.

Pressing the *ON/OFF* front panel key starts and stops the measurement.

Additional Information...

... on Step 2

Analyzer/Generator screen

The *Analyzer/Generator* screen contains two panels of information:

- Measurement results
- Settings

The status of the *Modulation* measurement is included in the softkey. For ongoing measurements, the results in the output fields are constantly updated.

Changing the RF Channel number automatically adjusts the base station's transmit and receive frequencies (BS Tx Frequency and BS Rx Frequency) to the corresponding RF Channel number.

The *Audio* hotkey displays the measurement screen for making audio measurements. These functions and settings are described in the CMU Operating manual.

Alternative Settings and Measurements

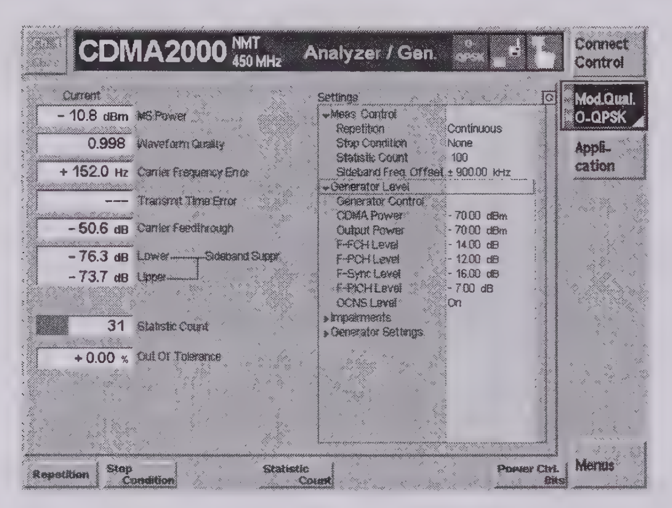
☞ Chapter 4

The section *CDMA Module Tests* in Chapter 4 of this manual provides detailed information about all measurement settings, measurement results, and a description of all softkey/hotkey menu buttons.

The current options for the measurement state are *RUN* (default) and *OFF*. A third state, *HLT*, occurs after a single-shot measurement.

Once selected, the Generator or Modulation measurement is switched off and on again by means of the toggle key *ON/OFF*.

☞ CMU Operating manual


CDMA2000 NMT 450 MHz
Analyzer / Gen.
O-QPSK
Connect Control
Mod.Qual. O-QPSK
Appli-cation
Menus
Repetition
Stop Condition
Statistic Count
Power Ctrl. Bits

Current
- 10.8 dBm MS Power
0.998 Waveform Quality
+ 152.0 Hz Carrier Frequency Error
--- Transmit Time Error
- 50.6 dB Carrier Feedthrough
- 76.3 dB Lower Sideband Suppr.
- 73.7 dB Upper
31 Statistic Count
+ 0.00 % Out Of Tolerance

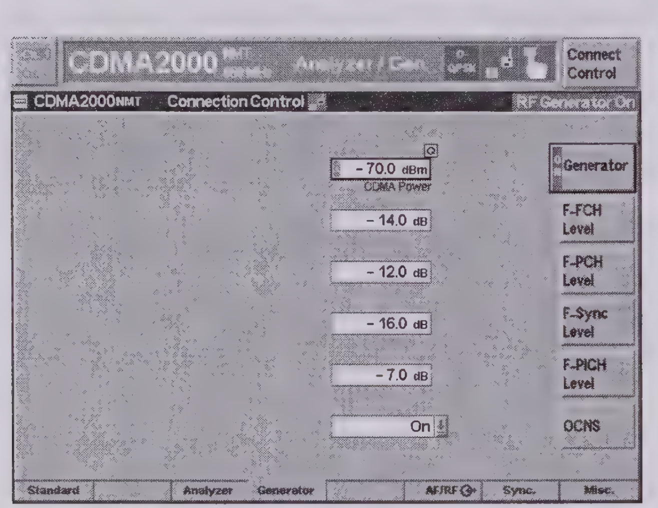
Settings
- Meas. Control
  - Repetition: Continuous
  - Stop Condition: None
  - Statistic Count: 100
  - Sideband Freq. Offset: ± 900.00 kHz
- Generator Level
  - Generator Control
  - CDMA Power: - 70.00 dBm
  - Output Power: - 70.00 dBm
  - F-FCH Level: - 14.00 dB
  - F-PCH Level: - 12.00 dB
  - F-Sync Level: - 16.00 dB
  - F-PICH Level: - 7.00 dB
  - OCNS Level: On
- Impairments
- Generator Settings

Step 3

Press the measurement softkey (in this example, the softkey is labeled *Mod. Qual. O-QPSK*). This displays a set of hotkeys at the bottom of the screen.

The hotkeys at the bottom of the screen allow you to adjust the measurement control settings.

The remainder of the settings are adjusted using the *Modulation Configuration* pop-up window.


CDMA2000
Analyzer / Gen.
Connect Control
CDMA2000NMT Connection Control
RF Generator On
Generator
F-FCH Level
F-PCH Level
F-Sync Level
F-PICH Level
OCNS
Standard
Analyzer
Generator
AF/RF
Sync.
Misc.

- 70.0 dBm CDMA Power
- 14.0 dB
- 12.0 dB
- 16.0 dB
- 7.0 dB
On

Step 4

Press the Connect Control softkey. This displays the Connection Control screen.

Select the Generator tab at the bottom of the display.

The Generator settings allow you to adjust all generator settings and turn the RF Generator on or off.

Press the Connect Control softkey again to return to the measurement screen.

Additional Information...

Alternative Settings and Measurements

... on Step 3

After Reset, all parameters are set to their default values. The parameters are displayed in the *Settings* window.

☞ Chapter 4

The *Modulation Configuration* pop-up window is accessed by pressing the measurement softkey twice (or once if already selected). In this example, the measurement softkey is labeled *Mod.Qual. O-QPSK*.

... on Step 4

The Generator tab has two screens of settings. Pressing the hotkey toggles the display between the two screens.

☞ Chapter 4

Additional tabs of the Connection Control screen allow the setup and control of other aspects of the CMU. These settings are described in Chapter 4 of this manual.

Signalling Mode

In the Signalling mode the CMU transmits a pilot, sync, and paging channel signal to which the mobile is able to synchronize. A call can then be established from either the CMU or the mobile.

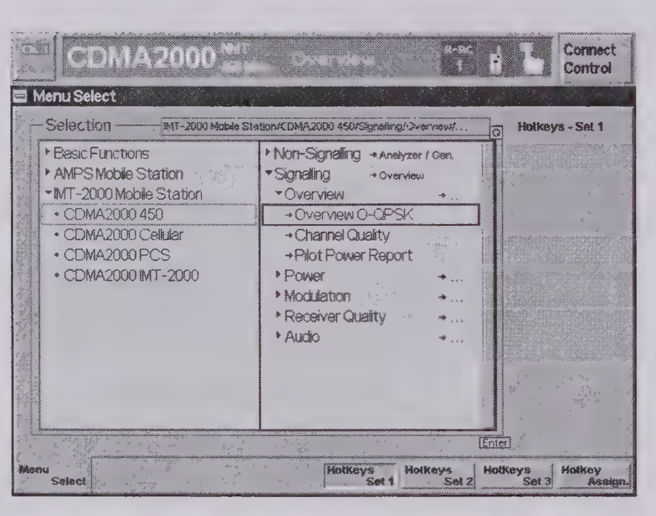
Call Setup and Signalling Parameters

The signalling processes and configurations are controlled via the *Connection Control* popup menu. The *Connection Control* popup menu is automatically displayed when the *Signalling* Mode is selected.

MENU
SELECT

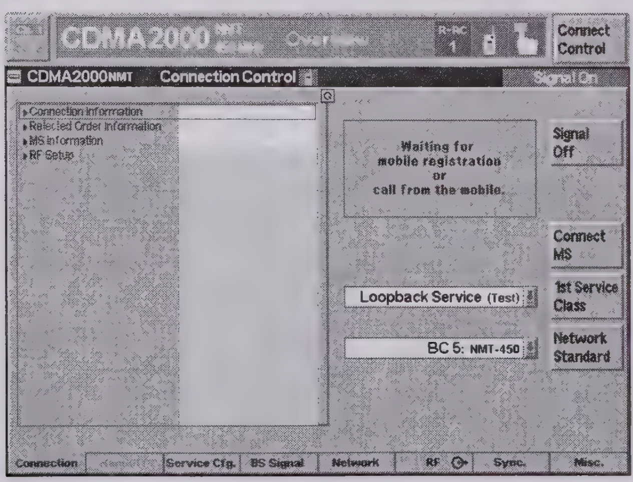
Step 1

- Press the *Menu Select* key to open the *Menu Select* menu.


CDMA2000
Connect Control
Menu Select
Hotkeys - Set 1
Basic Functions
AMPS Mobile Station
IMT-2000 Mobile Station
CDMA2000 450
CDMA2000 Cellular
CDMA2000 PCS
CDMA2000 IMT-2000
Non-Signaling → Analyzer / Gen.
Signaling → Overview
Overview → ..
→ Overview O-QPSK
→ Channel Quality
→ Pilot Power Report
Power → ...
Modulation → ...
Receiver Quality → ...
Audio → ...
Enter
Menu Select
HotKeys Set 1
HotKeys Set 2
HotKeys Set 3
Hotkey Assign.

Selection: IMT-2000 Mobile Station/CDMA2000 450/Signaling/Overview/...

- Select CMDA2000 450 from the function group.
- Select the *Signalling* test mode and expand the list.
- Scroll to *Overview* and expand the list.
- Scroll to Overview O-QPSK.
- Press the *Enter* key to activate the measurement and display the measurement screen.


CDMA2000
Connect Control
CDMA2000NMT
Connection Control
Signal On
Connection Information
Rejected Order Information
MS Information
RF Setup
Signal Off
Connect MS
1st Service Class
Network Standard
Connection
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

Waiting for mobile registration or call from the mobile.

Loopback Service (Test)

BC 5: NMT-450

The CMU immediately displays the Connection Control Screen and turns on the registration signal.

Wait for the mobile station to register with the CMU.

Additional Information...

... on Step 1

Since making measurements requires a connection to a mobile station, the CMU immediately displays the *Connection Control* screen if a connection is not established prior to starting a measurement.

If the automatic display of the Connection Control screen is disabled, the measurement screen is displayed with or without a connection to the mobile. A connection must be established for any measurements to return results.

The default settings are usually appropriate for registration to occur with a properly connected mobile station.

Parameters most likely needing to be set (to match the mobile station) are:

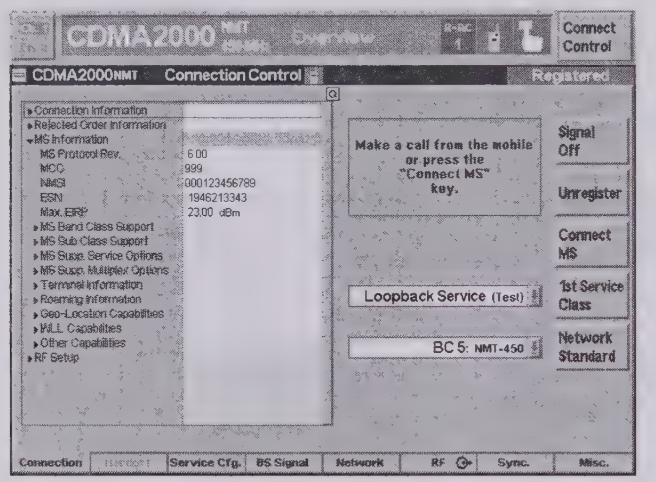
- Network Standard
- BS RF channel
- System ID

Refer to Step 2 on the following pages.

Alternative Settings and Measurements

The immediate display of the connection control screen can be disabled by deselecting *Auto Open if not connected* under *Connection Control Behavior* in the *Misc.* tab of the *Connection Control* menu.

☞ Chapter 4


CDMA2000
Connect Control
CDMA2000NMT Connection Control
Registered
Connection Information
Rejected Order Information
MS Information
MS Band Class Support
MS Sub Class Support
MS Supp. Service Options
MS Supp. Multiplex Options
Terminal Information
Roaming Information
Geo-Location Capabilities
WLL Capabilites
Other Capabilities
RF Setup
Signal Off
Unregister
Connect MS
1st Service Class
Network Standard
Connection
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

MS Protocol Rev. 6.00
MCC 999
NMSI 000123456789
ESN 1946213343
Max. EIRP 23.00 dBm

Make a call from the mobile or press the "Connect MS" key.

Loopback Service (Test)

BC 5: NMT-450

Step 2

After registration, the MS Information area now contains the important parameters characterizing the mobile station.

If the mobile doesn't register with the CMU, there may be configuration settings that don't match the mobile station. Check the requirements of the mobile station, signal settings, channels, and connections.

Additional Information...

... on Step 2

Connection Control is divided into pages accessed by the tabs at the bottom of the screen.

The tabbed pages provide access to all signalling parameters. Typically the default settings allow a call to be established. The Connection Control parameter settings are global settings. Individual measurement settings override these global parameters.

Connection

The *Connection* tab displays the most important parameters characterizing the signals generated by the CMU.

Handoff

The *Handoff* tab displays the handoff capabilities of the CMU. In this instance, the tab is gray since there are no handoffs to be made.

Service Cfg.

The *Service Cfg.* tab displays the parameters of the fundamental channel.

BS Signal

The *BS Signal* tab displays the configuration settings to simulate a base station. From the *BS Signal* tab you can access the parameters set in the *Signalling* tab. In addition you can set the CDMA Levels and Handoff Parameters.

Network

The *Network* tab displays the configuration of the network identity and other parameters characterizing the network.

RF ⊸

Input/output connectors suitable for the type of measurements and signal levels must be chosen. An external input/output attenuation value can be specified in order to compensate for known attenuation of the input/output signal like those caused by cables.

Sync.

The Sync. tab defines the reference frequency and sync signal used by the CMU.

Misc.

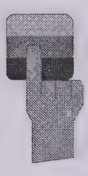
The *Misc.* tab contains user settings typically set once for the instrument, such as the trigger source and the connection control behavior.

Alternative Settings and Measurements

☞ Chapter 4.

Input/output connectors and external attenuation are configured in the RF ⊸ index card.

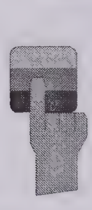
1st Service Class



Step 3

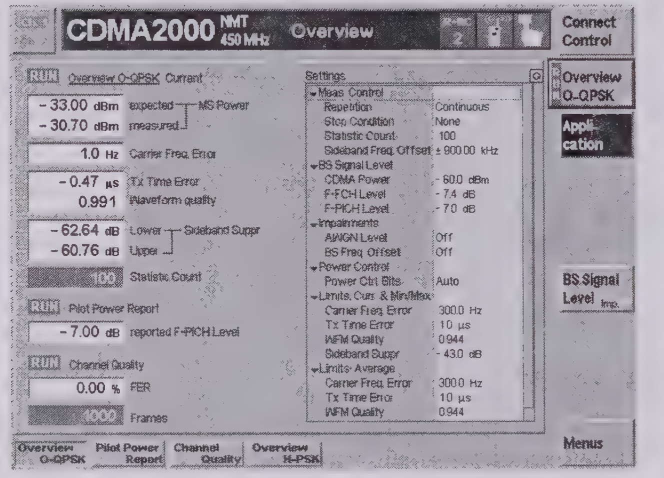
- Press the 1st Service Class softkey and select the Loopback Service.

Connect MS



Step 4

- Press the *Connect MS* softkey to establish a call with the mobile station.


CDMA2000 NMT 450 MHz
Overview
2
Connect Control
Overview O-QPSK
Application
BS Signal Level Imp.
Menus
RUN
RUN
RUN
Overview O-QPSK
Pilot Power Report
Channel Quality
Overview H-PSK

Overview O-QPSK Current

MS Power: expected − 33.00 dBm, measured − 30.70 dBm

1.0 Hz Carrier Freq. Error

− 0.47 µs Tx Time Error

0.991 Waveform quality

Sideband Suppr: Lower − 62.64 dB, Upper − 60.76 dB

100 Statistic Count

Pilot Power Report

− 7.00 dB reported F-PICH Level

Channel Quality

0.00 % FER

1000 Frames

Settings
- Meas. Control
  - Repetition: Continuous
  - Stop Condition: None
  - Statistic Count: 100
  - Sideband Freq. Offset: ± 900.00 kHz
- BS Signal Level
  - CDMA Power: − 60.0 dBm
  - F-FCH Level: − 7.4 dB
  - F-PICH Level: − 7.0 dB
- Impairments
  - AWGN Level: Off
  - BS Freq. Offset: Off
- Power Control
  - Power Ctrl Bits: Auto
- Limits: Curr. & Min/Max
  - Carrier Freq. Error: 300.0 Hz
  - Tx Time Error: 1.0 µs
  - WFM Quality: 0.944
  - Sideband Suppr: − 43.0 dB
- Limits: Average
  - Carrier Freq. Error: 300.0 Hz
  - Tx Time Error: 1.0 µs
  - WFM Quality: 0.944

Step 5

After the call is established, the CMU displays the Overview O-QPSK measurement screen. This was the selection made in the function menu starting the connect procedure.

The Overview O-QPSK displays the current O-QPSK measurements.

The Application softkey displays a set of hotkeys of available applications while in the Overview measurement.

From this screen, you can adjust the base station signal levels or impairments.

The Menus softkey displays a set of hotkeys to switch to other measurement types.

Additional Information...

... on Step 3

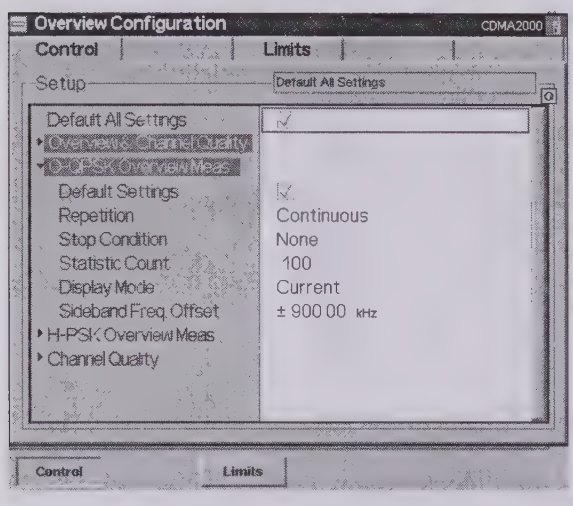
The *1st Service Class* softkey displays the call mode method to use when connecting to the mobile station. *Loopback Service* is generally used for testing. *Speech Service* is used to place a voice call to the mobile.

CDMA2000 receiver quality measurements require that a Loopback Service call be established with the mobile station. The Speech Service mode is used to place a voice call to the mobile. Modulation measurements may run slower in Speech Service since the mobile station signal may not be using Full Rate.

The parameters for the service types are configured in the *Service Config.* tab.

Alternative Settings and Measurements

☞ Chapter 4.

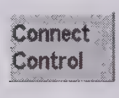

Overview Configuration
CDMA2000
Control
Limits
Setup
Overview&Channel Quality
Q-QPSK Overview Meas
H-PSK Overview Meas
Channel Quality
Control
Limits

Default All Settings ✓
Default Settings ✓
Repetition Continuous
Stop Condition None
Statistic Count 100
Display Mode Current
Sideband Freq. Offset ± 900.00 kHz

Step 6

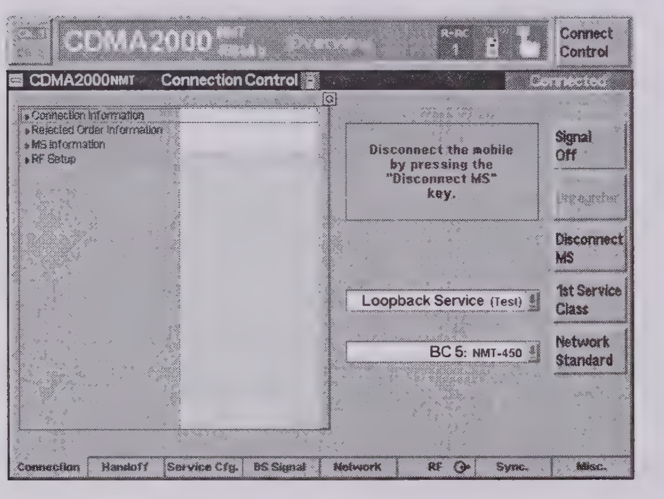
Press the measurement softkey twice (once if already highlighted).

This displays the *Overview Configuration* screen to adjust control of the measurement and its limits.


Connect
Control

Step 7

- Press the Connect Control softkey to display the Connection Control screen.


CDMA2000
Connect
Control
CDMA2000NMT
Connection Control
Connected
Connection Information
Rejected Order Information
MS Information
RF Setup
Signal
Off
Disconnect
MS
1st Service
Class
Network
Standard
Connection
Handoff
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

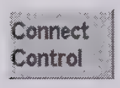
Disconnect the mobile by pressing the "Disconnect MS" key.

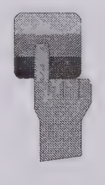
Loopback Service (Test)

BC 5: NMT-450

The connection control screen now indicates it is connected to the mobile.

Closing the Connection Control screen returns the CMU to the last measurement menu accessed. In this case the CMU returns to the Overview menu by default since no measurement menu has been displayed


Connect
Control



Step 8

- Press the *Connect Control* softkey again to return to the measurement screen.

Additional Information...

... on Step 6

The Overview Configuration screen displays two tabs, Control and Levels. The Control tab contains all the settings that affect control of the measurement and the Limits tab contains all the settings to define the limits of the measurement.

Softkeys and hotkeys

To enlarge the diagram area of the graphical measurement menus, the left softkey column is suppressed. The functionality of each softkey on the right side is extended by hotkeys. These hotkeys are displayed in the hotkey bar below the diagram when the softkey is selected.

Configuration settings

Some of the softkey/hotkey combinations offer settings that can also be accessed via configuration menus. For example, the settings offered by the *CDMA Levels* softkey (for Gated Output) is equivalent to *Levels* in the *Control* tab (for Gated Output) of the *Power Configuration* menu. Identical settings overwrite each other.

Each measurement group and each application (within the group) stores its own configuration settings. For example, the Pilot Level setting for the Gated Output application is separate from the Pilot Level setting for the Open Loop time Resp. application.

... on Step 8

Closing the Connection Control screen returns the CMU to the last measurement menu accessed. In this case the CMU returns to the Overview menu by default since no measurement menu has been displayed.

Alternative Settings and Measurements

☞ Chapter 4.

☞ Chapter 4.

The *Application* softkey switches between the applications of the Power measurement.

The *CDMA Levels* softkey displays a set of hotkeys to adjust the CDMA power and channel levels.

The *Time* softkey defines the zoom area.

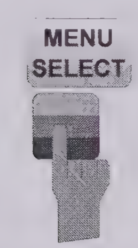
The *Marker* softkey sets markers and a D-line. (A D-line is used to mark levels and a reference point for markers.)

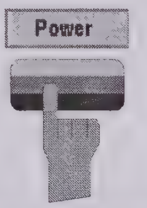
The *Statistics* softkey sets the number of measurement intervals per statistic cycle.

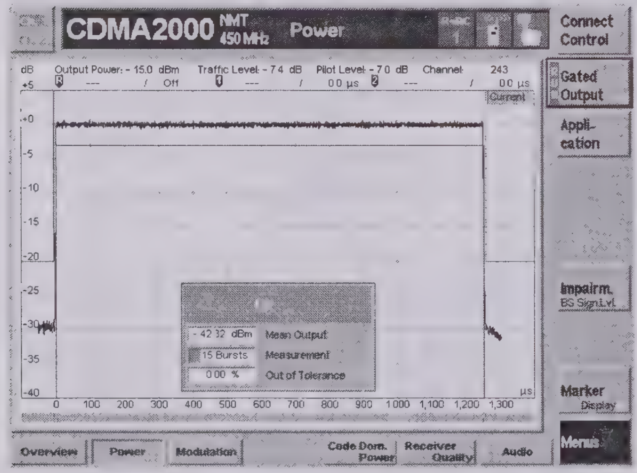
Power Measurements

The Power measurement menu provides information about the mobile station's power levels and performance. The CMU provides four applications to measure and display power measurements. In this signalling example, only the *Gated Output* application is selected.

Step 1


MENU SELECT




CDMA2000
NMT 450 MHz
Power
Connect Control
Gated Output
Current
Appli-cation
Impairm. BS Sign.Lvl.
Marker Display
Menus
dB
+5
+0
-5
-10
-15
-20
-25
-30
-35
-40
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
µs
Overview
Power
Modulation
Code Dom. Power
Receiver Quality
Audio

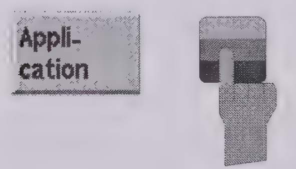
Output Power: - 15.0 dBm / Off
Traffic Level: - 7.4 dB / 0.0 µs
Pilot Level: - 7.0 dB / 0.0 µs
Channel: 243

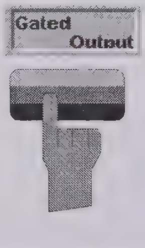
- 42.32 dBm Mean Output
15 Bursts Measurement
0.00 % Out of Tolerance

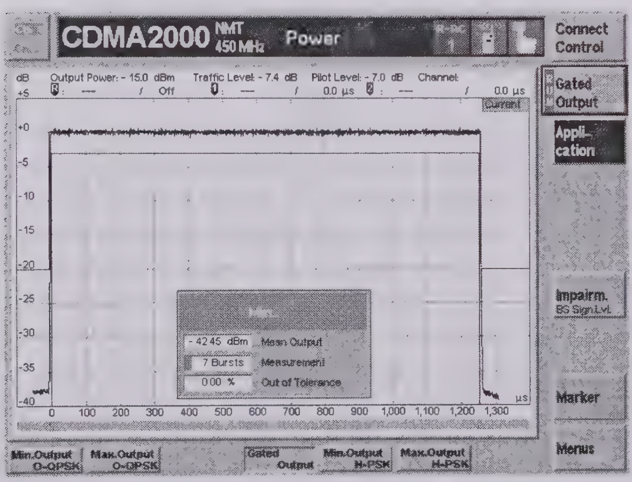
- Press the *Menu Select* key to open the *Menu Select* menu.
- Press the *Power* hotkey to switch to the Power measurement applications.

The last power application accessed is displayed. In this example, the Gated Output application is displayed.

Step 2


Appli-cation


Gated Output


CDMA2000
NMT 450 MHz
Power
Connect Control
Gated Output
Current
Appli-cation
Impairm. BS Sign.Lvl.
Marker
Menus
dB
+5
+0
-5
-10
-15
-20
-25
-30
-35
-40
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
µs
Min.Output O-QPSK
Max.Output O-QPSK
Gated Output
Min.Output H-PSK
Max.Output H-PSK

Output Power: - 15.0 dBm / Off
Traffic Level: - 7.4 dB / 0.0 µs
Pilot Level: - 7.0 dB / 0.0 µs
Channel:

- 42.45 dBm Mean Output
7 Bursts Measurement
0.00 % Out of Tolerance

- Press the *Application* softkey. The available power applications are displayed in the hotkey bar.
- Press the *Gated Output* hotkey to change to the *Gated Output* application.

The *Gated Output* power application shows the gated output power as a function of time.

A tolerance template is displayed. The settings (default at this time) and scalar results are displayed in the parameter line above the diagram and in a message box positioned in the diagram area.

Additional Information...

Alternative Settings and Measurements

... on Step 1

If the Power hotkey is not displayed, press the *MENU SELECT* key. The menu group *Power* contains the functions to measure the received signal power. The *Power Configuration* popup menu configures all power measurements.

Softkeys and hotkeys

To enlarge the diagram area of the graphical measurement menus, the left softkey column is suppressed. The functionality of each softkey on the right side is extended by hotkeys. These hotkeys are displayed across the hotkey bar below the diagram when the softkey is selected.

... on Step 2

There are six power applications (in the hotkey bar).

☞ Chapter 4.

Minimum Output O-QPSK measures the mobile station's minimum output power.

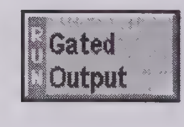
Maximum Output O-QPSK measures the mobile station's maximum output power.

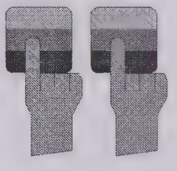
CoDomain measures the mobile station's code domain power.

Gated Output displays the time response of the mean output power for isolated gated-on power control groups.

Minimum Output H-PSK measures the mobile station's minimum output power.

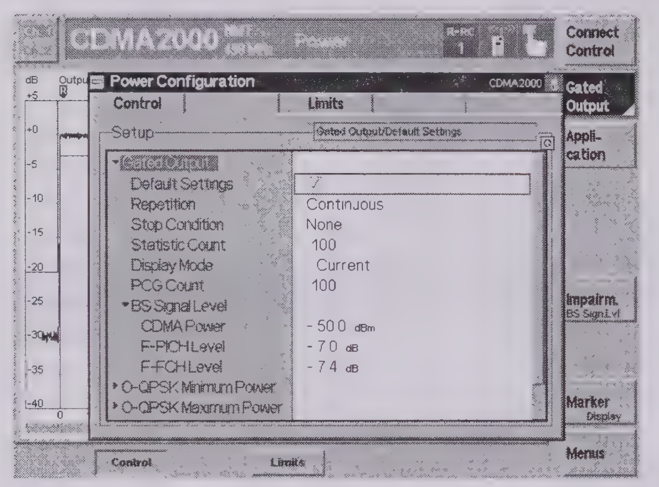
Maximum Output H-PSK measures the mobile station's maximum output power.


RUN
Gated
Output



Step 3

- Press the measurement softkey twice to open the *Power Configuration* menu. In this example, the measurement softkey is labeled *Gated Output*.


CDMA2000
Power
Connect Control
Gated Output
Appli-cation
Impairm. BS Sign.Lvl
Marker Display
Menus
Control
Limits
dB
+5
+0
-5
-10
-15
-20
-25
-30
-35
-40
0

Power Configuration CDMA2000

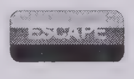
Control | Limits

Setup — Gated Output/Default Settings

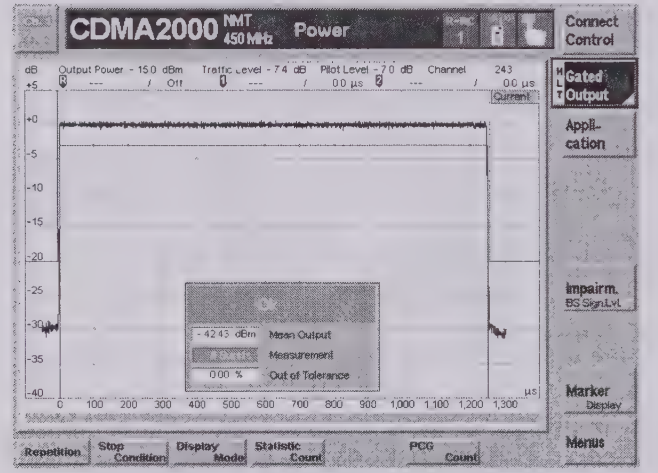
- Gated Output
  - Default Settings
  - Repetition: Continuous
  - Stop Condition: None
  - Statistic Count: 100
  - Display Mode: Current
  - PCG Count: 100
  - BS Signal Level
    - CDMA Power: -50.0 dBm
    - F-PICH Level: -7.0 dB
    - F-FCH Level: -7.4 dB
- O-QPSK Minimum Power
- O-QPSK Maximum Power

The *Power Configuration* menu defines each of the power measurement applications. In this example, we will adjust a parameter of the *Gated Output* application.

- Press the *Control* hotkey to display the *Control* tab.
- Scroll down to view the *Gated Output* parameters.
- Press the *EXP/CMP* key to expand the menu table.
- Scroll to the *Repetition* parameter, press *Enter*, and set it to *Single Shot*.



- Press the *ESCAPE* key to close the *Power Configuration* menu and return to the main menu.


CDMA2000 NMT 450 MHz
Power
Connect Control
HLT Gated Output
Appli-cation
Impairm. BS Sign.Lvl
Marker Display
Menus
Repetition
Stop Condition
Display Mode
Statistic Count
PCG Count
Current
dB
+5
+0
-5
-10
-15
-20
-25
-30
-35
-40
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
µs

Output Power -15.0 dBm | Traffic Level -7.4 dB | Pilot Level -7.0 dB | Channel 243

R --- / Off | 1 --- / 0.0 µs | 2 --- / 0.0 µs

-42.43 dBm Mean Output

Measurement

0.00 % Out of Tolerance

The power measurement is stopped after one statistic cycle. The status indication next to the *Gated Power* softkey is set to *HLT*.

Additional Information...

... on Step 3

Repetition mode

Repetition determines the repetition mode of the measurement (single shot or continuous).

Single Shot:	The measurement is stopped after a statistic cycle, i.e. after the number of waveform intervals/evaluation periods set in the configuration menu *Statistics.*
Continuous:	The CMU continues the measurement until it is terminated explicitly or until the stop condition is met.

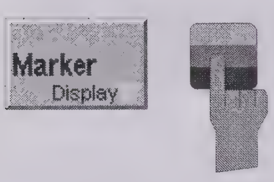
The Stop Condition setting can affect the Single Shot and Continuous repetition modes.

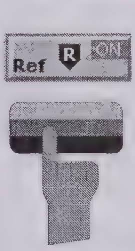
Alternative Settings and Measurements

Settings made in the *Power Configuration* menu apply only to the power measurements.

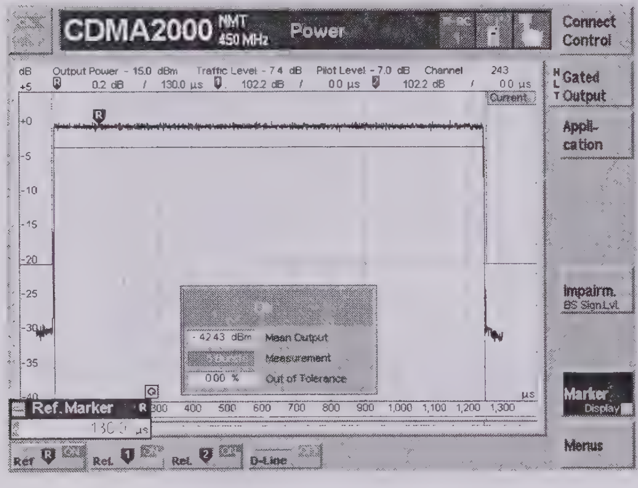
Settings made in the *Connection Control* menu apply to the entire CDMA2000 function group. Individual measurements settings override these settings.

Step 4


Marker
Display



- Press the Marker softkey.
- Press the Ref R hotkey and enter a value to position the reference marker onto the trace.



CDMA2000 NMT 450 MHz Power

Output Power - 15.0 dBm Traffic Level - 7.4 dB Pilot Level - 7.0 dB Channel 243

R 0.2 dB / 130.0 µs 1 102.2 dB / 0.0 µs 2 102.2 dB / 0.0 µs

-42.43 dBm Mean Output

Measurement

0.00 % Out of Tolerance

Ref. Marker R 130.0 µs

Connect Control
Gated Output
Appli-cation
Impairm. BS Sign.Lvl.
Marker Display
Menus
Current
dB
+5
+0
-5
-10
-15
-20
-25
-30
-35
-40
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
µs
Ref R
Rel. 1
Rel. 2
D-Line

The reference marker is positioned on the trace and the coordinates are displayed in the parameter line.

Additional Information...

... on Step 4

Softkeys and hotkeys

To enlarge the diagram area of the graphical measurement menus, the left softkey column is suppressed. The functionality of each softkey on the right side is extended by hotkeys. These hotkeys are displayed in the hotkey bar below the diagram when the softkey is selected.

Configuration settings

Some of the softkey/hotkey combinations offer settings that can also be accessed via configuration menus. For example, the settings offered by the *CDMA Levels* softkey (for Gated Output) is equivalent to *Levels* in the *Control* tab (for Gated Output) of the *Power Configuration* menu. Identical settings overwrite each other.

Each measurement group and each application (within the group) stores its own configuration settings. For example, the Pilot Level setting for the Gated Output application is separate from the Pilot Level setting for the Open Loop time Resp. application.

... on Step 5

Markers

Markers are a graphical tool used to locate points on a trace and read out their coordinates. A reference marker and two delta markers may be defined in the *Power* menu.

The reference marker measures the absolute level of the trace. The delta markers either measure the distance between their position and the reference marker (relative mode) or the absolute level (absolute mode).

Alternative Settings and Measurements

☞ Chapter 4.

The *Application* softkey switches between the applications of the Power measurement.

The *CDMA Levels* softkey displays a set of hotkeys to adjust the CDMA power and channel levels.

The *Time* softkey defines the zoom area.

The *Marker* softkey sets markers and a D-line. (A D-line is used to mark levels and a reference point for markers.)

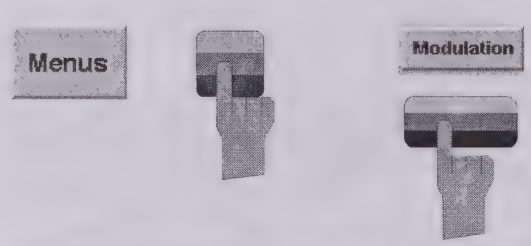
The *Statistics* softkey sets the number of measurement intervals per statistic cycle.

☞ Chapter 4.

In addition to markers, a D-line can be used to measure a particular level in the diagram and used as a reference point for markers.

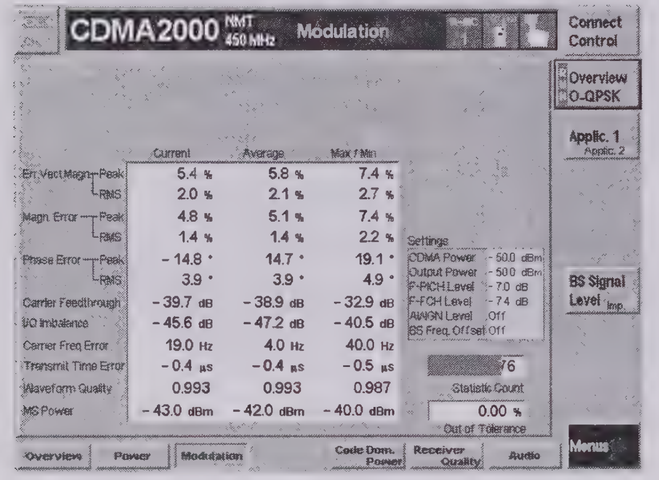
Modulation Measurements

We can use the hotkey bar to switch over to the Modulation measurement.


Menus
Modulation

Step 1

- Press the *Menus* softkey to display the measurement groups in the hotkey bar.
- Press the *Modulation* hotkey to switch to the *Modulation* measurements.


CDMA2000 NMT 450 MHz
Modulation
Connect Control
Overview O-QPSK
Applic. 1 Applic. 2
BS Signal Level Imp.
Menus
Overview
Power
Modulation
Code Dom. Power
Receiver Quality
Audio

		Current	Average	Max / Min
Err.Vect.Magn.	Peak	5.4 %	5.8 %	7.4 %
	RMS	2.0 %	2.1 %	2.7 %
Magn. Error	Peak	4.8 %	5.1 %	7.4 %
	RMS	1.4 %	1.4 %	2.2 %
Phase Error	Peak	– 14.8 °	14.7 °	19.1 °
	RMS	3.9 °	3.9 °	4.9 °
Carrier Feedthrough		– 39.7 dB	– 38.9 dB	– 32.9 dB
I/Q Imbalance		– 45.6 dB	– 47.2 dB	– 40.5 dB
Carrier Freq Error		19.0 Hz	4.0 Hz	40.0 Hz
Transmit Time Error		– 0.4 µs	– 0.4 µs	– 0.5 µs
Waveform Quality		0.993	0.993	0.987
MS Power		– 43.0 dBm	– 42.0 dBm	– 40.0 dBm

Settings

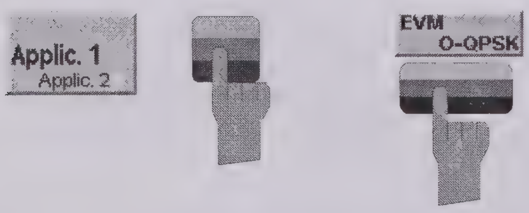
CDMA Power	- 50.0 dBm
Output Power	- 50.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
AWGN Level	Off
BS Freq. Offset	Off

76 Statistic Count

0.00 % Out of Tolerance

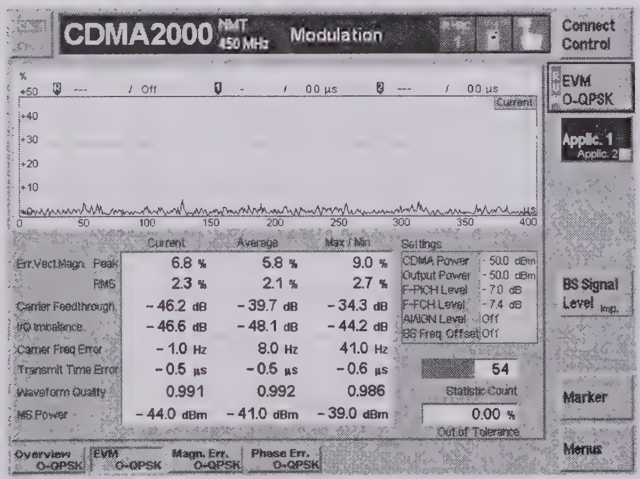
The *Modulation - Overview* menu displays the main results of the Modulation measurement.

If a result exceeds the tolerances, the corresponding output field is red and an arrow pointing upwards or downwards indicates that the result is above or below the limit.


Applic. 1
Applic. 2
EVM
O-QPSK

Step 2

- Press the *Application* hotkey to display the available Modulation applications in the hotkey bar.
- Press the *EVM* hotkey to change to the Error Vector Magnitude application.


CDMA2000 NMT 450 MHz
Modulation
Connect Control
%
+50
R --- / Off
1 - / 0.0 µs
2 --- / 0.0 µs
Current
+40
+30
+20
+10
0
µs
0
50
100
150
200
250
300
350
400
EVM O-QPSK
Applic. 1 Applic. 2
BS Signal Level Imp.
Marker
Menus
Overview O-QPSK
EVM O-QPSK
Magn. Err. O-QPSK
Phase Err. O-QPSK

		Current	Average	Max / Min
Err.Vect.Magn.	Peak	6.8 %	5.8 %	9.0 %
	RMS	2.3 %	2.1 %	2.7 %
Carrier Feedthrough		– 46.2 dB	– 39.7 dB	– 34.3 dB
I/Q Imbalance		– 46.6 dB	– 48.1 dB	– 44.2 dB
Carrier Freq Error		– 1.0 Hz	8.0 Hz	41.0 Hz
Transmit Time Error		– 0.5 µs	– 0.5 µs	– 0.6 µs
Waveform Quality		0.991	0.992	0.986
MS Power		– 44.0 dBm	– 41.0 dBm	– 39.0 dBm

Settings

CDMA Power	- 50.0 dBm
Output Power	- 50.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
AWGN Level	Off
BS Freq. Offset	Off

54 Statistic Count

0.00 % Out of Tolerance

The *Modulation – Error Vector Magnitude* menu displays a graph of the *Error Vector Magnitude* as percentage vs. time.

The output fields below the graph correspond to the ones shown in the Overview application. Since we are viewing the *Error Vector Magnitude* application, the *Magnitude Error* and *Phase Error* are not shown.

Additional Information...

Alternative Settings and Measurements

... on Step 1

Statistical quantities

The table in the *Overview* menu reports peak and RMS-averaged values of quantities characterizing the errors of the modulation vector. In addition, the scalar modulation results *Carrier Feedthrough, I/Q Imbalance,* Carrier *Frequency Error, Transmission Time Error, Waveform Quality*, and *MS Power* are indicated.

The values in the three columns of the table are calculated as follows:

- The *Current* column contains the results for the current measurement.
- The *Average* column contains the current results averaged over the last statistic cycle.
- The *Max./Min.* column contains the extreme values of the current results for all measurements.

... on Step 2

Applications

Applications are different measurements belonging to the same measurement group. Each application is assigned its own set of configuration parameters allowing configuration of each application individually.

The *Modulation* menu comprises the four applications *Overview O-QPSK, Error Vector Magnitude, Magnitude Error*, and *Phase Error.*

Measured values and limits

☞ Chapter 4.

The limits may be modified in the *Limits* tab of the *Modulation Configuration* menu which is opened by pressing the measurement softkey twice. The *Modulation Configuration* menu is similar to the *Power Configuration* menu explained on the previous pages.

The measurement principle for phase and frequency errors is explained at the beginning of section *Modulation Measurement Menu.*

The absolute values are given for modulation measurements. This is why the display modes Minimum and Maximum can not be selected separately. The CMU displays the extreme values with the correct sign.

Contents

3 Manual Control 3.1

Menu Structure 3.1

Test Modes 3.2

Signalling Symbols 3.3

Configurations 3.4

Measurement Groups 3.5

General Settings 3.6

3 Manual Control

This chapter gives a brief overview of the operating concept and structure of the user interface for CDMA mobile phone tests. The CMU is designed for maximum operating convenience and flexibility. All instrument functions are grouped together in menus. Each menu provides configuration settings, displays a group of measured quantities, or a combination of both. Switching between the different menu groups and signalling modes is possible at any time.

In the following sections, the different measurement modes and measured quantities are discussed. Settings and measurement parameters frequently encountered are explained from a general point of view.

The formal aspects of measurement control are discussed in more detail in Chapter 5 *(Remote Control – Basics)*. For information about the CMU's control elements, menu types and dialog elements within the menus refer to Chapter 3 of the CMU Operating manual.

Menu Structure

The menus used to control CDMA2000 measurements can be arranged in different ways. From a functional point of view, they form the following groups:

- The CDMA2000 function groups:
    - CDMA2000 450
    - CDMA2000 Cellular
    - CDMA2000 PCS
    - CDMA2000 IMT-2000
- The two tests modes:
    - Signalling
    - Non-Signalling
- General configurations (Connection Control)
- Measurement groups (Analyzer/ Generator, Overview, Power, Modulation, Code Domain Power, Receiver Quality)
- Configurations specific to the measurement groups

The CMU uses main menus, popup menus, graphical measurement menus and dialog windows of various size. Refer to Chapter 3 of the CMU Operating manual for discussions about menus.

Test Modes

CDMA2000 measurements are performed in one of the two modes *Signalling* or *Non-signalling*. The *Non-Signalling* mode is typically used for module tests or test of mobiles in a special "test mode". The *Signalling* mode measures the mobile phone performance under realistic operating conditions where the CMU mimics a CDMA2000 base transceiver station.

Definition

The term signalling denotes all actions necessary to establish, control and terminate a communication between the base station (CMU) and the mobile phone. The signalling messages conveyed allow the mobile station and the network to discuss the management of issues either related to the user or concerning technical aspects of the communication.

Non-Signalling Mode

In the *Non-Signalling* mode, the CMU generates an RF signal conforming to CDMA2000 specifications and analyzes the signal transmitted by the device under test (DUT).

Signalling Mode

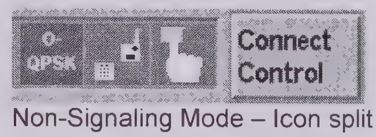
In the *Signalling* mode, the CMU first transmits a signal consisting of a pilot, sync, and paging channel. In subsequent steps, the mobile synchronizes to the channels, decodes the information transmitted, and performs a location update so that a call can be established from either the mobile or the CMU.

The signalling mode measures the mobile phone performance under realistic operating conditions where the CMU mimics a CDMA2000 base transceiver station. The CMU is able to configure a broad range of network parameters and to determine the parameters characterizing the mobile. Measurements of the power versus time, modulation parameters, and receiver quality can be performed.

Signalling Symbols

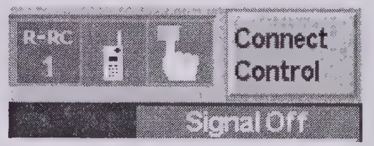
The signalling mode and state is indicated to the left of the operating mode in each main menu and measurement menu. The following icons (mobile station) represent each signalling mode and state:

Non-Signalling Mode

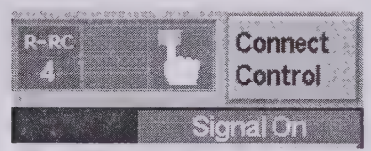

O-QPSK
Connect Control

Non-Signaling Mode – Icon split

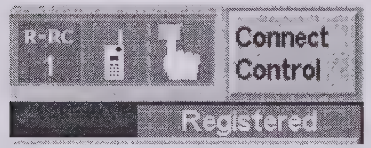
Signalling Mode


R-RC 1
Connect Control
Signal Off

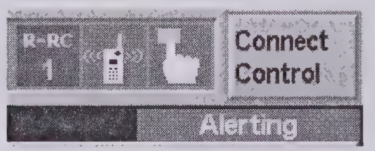
Signal Off – Icon has gray background


R-RC 4
Connect Control
Signal On

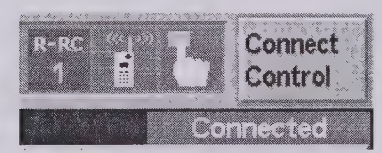
Signal On – No Icon


R-RC 1
Connect Control
Registered

Registered – Icon has green background


R-RC 1
Connect Control
Alerting

Alerting (Speech)


R-RC 1
Connect Control
Connected

Call Established

Configurations

The CMU offers a wide range of settings for the signal generator and analyzer, the signalling procedures, and the individual measurements. Configurations may apply to a whole function group (*Connection Control*) or to a particular measurement.

Connection Control

The *Connection Control* softkey is located on the right side of the title bar of each main and measurement menu. Depending on the mode (non-signalling or signalling), it opens a popup menu with tabs configuring the following:

Non-Signalling mode:

- Signals generated and analyzed by the instrument
- RF connectors to be used and the external attenuation
- Reference frequency

Signalling mode:

- Actions changing the CMU's signalling state
- RF connectors to be used and the external attenuation
- A call or a handoff to another network
- Parameters of the network and the mobile station under test
- Base station parameters

All settings made in the *Connection Control* menu apply to the whole function group.

Configurations of measurements

A popup menu offering specific settings is assigned to each measurement group *(Power, Modulation, Code Dmain Power, and Receiver Quality)*. The following parameters can be defined:

The repetition mode and stop condition for the measurement tolerances for the measured quantities, statistic count and display mode.

These settings are explained in more detail section General Settings on page 3.6).

Configuration via hotkeys

The softkeys and associated hotkeys in the graphical measurement menus provide the most important configurations for the current measurement (refer to Chapters 3 and 4 of the CMU Operating manual). Settings made via hotkeys supersede the corresponding settings found in the measurement configuration menu.

Measurement Groups

Measurement results are indicated in two different ways:

Discrete (scalar) values and parameters are displayed in output fields, lists and tables.

Traces are displayed in a Cartesian coordinate system (time forming the x-axis scale).

While the measurement is running, the indicated results are constantly updated. As shown in the table below, the measurement groups depend on the signalling mode.

Table 3-1: Measurement Groups in the Signalling and Non-Signalling Mode

Non-Signalling	Signalling
Analyzer/Generator Shows the settings for the signals generated and analyzed by the instrument and presents an overview of the basic scalar power and modulation results.	**Overview** Shows the settings for the traffic channel and speech mode and presents an overview of the basic scalar power and modulation results. The receiver parameters and various signalling parameters reported by the mobile station are displayed.
	Power The open loop time response and gated output are shown as a trace plotted over time. Single points of the trace may be evaluated by means of graphical tools (markers and display line). The power output (minimum and maximum) of the mobile station is measured.
	Modulation Shows the error vector magnitude, magnitude error and phase error of the transmitted waveform interval as a function of time. The carrier Feedthrough, I/Q imbalance, frequency error, transmission time error, waveform quality and MS power error are displayed.
	Code Domain Power The CMU measures the power of the mobile station's channels.
	Receiver Quality Shows the settings and results of the frame error rate test reported by the mobile station.

General Settings

A number of settings can be made in several of the configuration menus assigned to the measurement groups *Power*, *Modulation* and *Receiver Quality*. In combination, these settings define the scope of the measurement, i.e. the number of bursts measured and the results displayed. The following brief overview is intended to avoid confusion of terms.

Application

Applications are different measurements belonging to the same measurement group. They effectively split up a measurement group into various related subgroups which can be configured separately.

They are selected via the *Application* softkey in the measurement menus.

Statistic Count

The *statistic count* is set in the *Statistics* tab of the configuration popup-menus assigned to the measurement groups.

The statistic count is equal to the integer number of waveform intervals which forms one measurement cycle. Together with the *stop condition,* the *repetition mode* determines when exactly the measurement is stopped.

Repetition Mode

The *repetition mode* is set in the *Control* tab of the configuration popup-menus assigned to the three measurement groups *Power*, *Modulation*, and *Receiver Quality*.

The *repetition mode* defines how many waveform intervals are measured if the measurement is not stopped by a limit failure (see stop condition *On Limit Failure* below). Two modes are available for all measurements:

Single Shot	The measurement is stopped after one statistic count.
Continuous	The measurement is continued until explicitly terminated by the user.

Stop Condition

The *stop condition* is set in the *Control* tab of the configuration popup-menus assigned to the measurement groups.

None	The measurement is performed according to its repetition mode, regardless of the measurement results.
Halt on Error	The measurement is stopped as soon as one of the limits is exceeded, regardless of the repetition mode set. If no limit failure occurs, it is performed according to its repetition mode.

Display Mode

The *display mode* is set in the *Statistics* tab of the configuration popup-menus assigned to the two measurement groups *Power* and *Modulation.*

In the graphical measurement diagrams, the display mode defines which of the measured and calculated traces is displayed.

Traces are calculated from a set of test points with fixed abscissa values. These values are equidistantly distributed along the time axis.

Current	The current values are displayed.
Minimum	At each test point, the minimum measured value is displayed.

Maximum	At each test point, the maximum measured is displayed.
Minimum/ Maximum	At each test point, the extreme measured value is displayed, i.e. the maximum or minimum, whichever has a larger absolute value.
Average	At each test point, the arithmetic mean value of the last x number of waveform intervals is displayed where x is the number of waveform intervals forming one statistic count (the statistics window continuously moves in time).

Calculation of statistical quantities

The statistical functions *Average, Minimum, Maximum* and *Minimum/Maximum* are applied to a set of test points.

The result of a statistical operation depends on the parameter range considered. Following are some examples of statistical quantities.

1. In the *Power* menu, the quantity *Average Power* denotes the average power of the current power control groups.
2. In the *Modulation* menu the quantity *Frequency Error* is first calculated for the current waveform interval and entered in the *Current* column of the output table. The results in the *Minimum/Maximum* (*Average)* column correspond to the extreme value (the RMS value) of the *Current* results calculated over all measured waveform intervals.

Contents

4 Functions and their Applications 4.1

CDMA Module Tests (Non-Signalling Mode) 4.3

Analyzer/Generator Measurement Menu 4.4

Softkey Selections 4.5

Measurement Results 4.7

Connection Control in Non-Signalling 4.9

Network Standard (Connection Control – Standard) 4.9

Analyzer Control (Connection Control – Analyzer) 4.10

Generator Control (Connection Control – Generator) 4.11

RF Connectors (Connection Control – RF ⊖) 4.16

Reference Frequency (Connection Control – Sync.) 4.18

Analyzer Control (Connection Control – Miscellaneous) 4.20

CDMA Measurements 4.22

Call Setup (Connection Control) 4.24

Connection Control (Signal Off State) 4.25

Connection Control (Signal On State) 4.26

Connection Control (Registered State) 4.29

Connection Control (Alerting State) 4.31

Overview of the Function Group 4.32

Overview Configuration 4.35

Overview Configuration – Control 4.35

Overview Configuration – Limits 4.37

Power Measurements 4.38

Softkey Selections 4.38

Measurement Results 4.40

Minimum Output 4.41

Maximum Output 4.43

Gated Output 4.45

Power Configuration 4.48

Power Configuration – Control 4.48

Power Configuration – Limits 4.51

Modulation Measurements 4.53

Softkey Selections 4.54

Measurement Results 4.59

Overview 4.61

Phase Error Measurement 4.62

        Magnitude Error (ME) Measurement 4.63
        Error Vector Magnitude (EVM) Measurement 4.64
    Modulation Configuration 4.65
        Modulation Configuration – Control 4.65
        Modulation Configuration – Limits 4.68
Code Domain Power Measurements 4.69
    Softkey Selections 4.69
    Measurement Results 4.70
        Code Domain Power 4.71
        Peak Code Domain Error Power 4.75
        Channel Power 4.79
    Code Domain Power Configuration 4.83
        Code Domain Power Configuration – Control 4.83
        Code Domain Power Configuration – Limits 4.87
Receiver Quality Measurements 4.89
    Softkey Selections 4.90
    Measurement Results 4.93
    Receiver Quality Configurations 4.94
        Receiver Quality Configuration – Control 4.94
        Receiver Quality Configuration – Limits 4.97
Connection Control Menu 4.98
    Connection Control with Call Established (Connection Control – Connected) 4.98
    Handoff to Another Network (Connection Control – Handoff) 4.100
    Service Configuration of the CMU (Connection Control – Service Cfg.) 4.102
        Loopback Service 4.102
        Speech Service 4.105
    Signals of the CMU (Connection Control – BS Signal) 4.107
    Network Parameters (Connection Control – Network) 4.110
    RF Connectors (Connection Control – RF ○→) 4.114
    Miscellaneous User Settings (Connection Control – Misc.) 4.116

Marker Control 4.118

4 Functions and their Applications

This chapter explains in detail all functions for the measurement of mobile stations supporting the CDMA2000 standard. The CMU200 with Options K83, K84, K85, and/or K86 support the Networks listed in Table 4-1.

Table 4-1: CDMA Networks Supported

CMU Options for CDMA	Band Class	Network
CMU-K83 450 MHz	Band Class 5	NMT-450
CMU-K84 Cellular	Band Class 0	US and Korean Cellular
	Band Class 2	TACS
	Band Class 3	JTACS
	Band Class 7	North American 700 MHz
	Band Class 9	900 MHz
	Band Class 10	Secondary 800 MHz
CMU-K85 PCS	Band Class 1	North American PCS
	Band Class 4	Korean PCS
	Band Class 8	1800 MHz
CMU-K86 IMT-2000	Band Class 6	IMT-2000

Note: *The tests and screen shots provided in the manual are based on the* CDMA2000 450 *function group.*

The chapter is divided in two sections corresponding to the two function groups for module tests *(Non-Signalling)* and for mobile tests *(Signalling)*. Within the two sections, the discussion is structured according to the provided measurements and configurations.

The description of each softkey, select or input field is followed by the corresponding remote-control command(s).

Each menu and each panel is briefly described first and then illustrated together with its call button. The menu functions are explained according to the following principle:

Softkey	Short function definition	
Designation of select/input field	Definition of field function. Further description of the field: purpose, interaction with other settings, notes...	
	Parameter 1	Description of parameter 1
	Parameter 2	Description of parameter 2
	Further description of the parameters: purpose, interaction with other settings, notes...	
Remote control	`Remote-control command (long form) Parameter1	Parameter2 ...`	

> ***Note:*** *For all numerical values, including their ranges and default settings, please refer to the description of the remote-control commands in Chapter 6. The description of the operating concept is found in Chapter 3 of the CMU200 Operating manual.*

CDMA Module Tests (Non-Signalling Mode)

The structure of this section is based on the configuration and measurement groups defined in the function group *IMT-2000 Mobile Station, Non-Signalling* mode. The menus are dealt with in their order of operation:

- General settings (Analyzer/Generator) and display of generator signals
- Measurement menu (*Modulation*): performance of the measurements, output of measurement results, measurement configurations
- Global configurations *(Connection Control)*

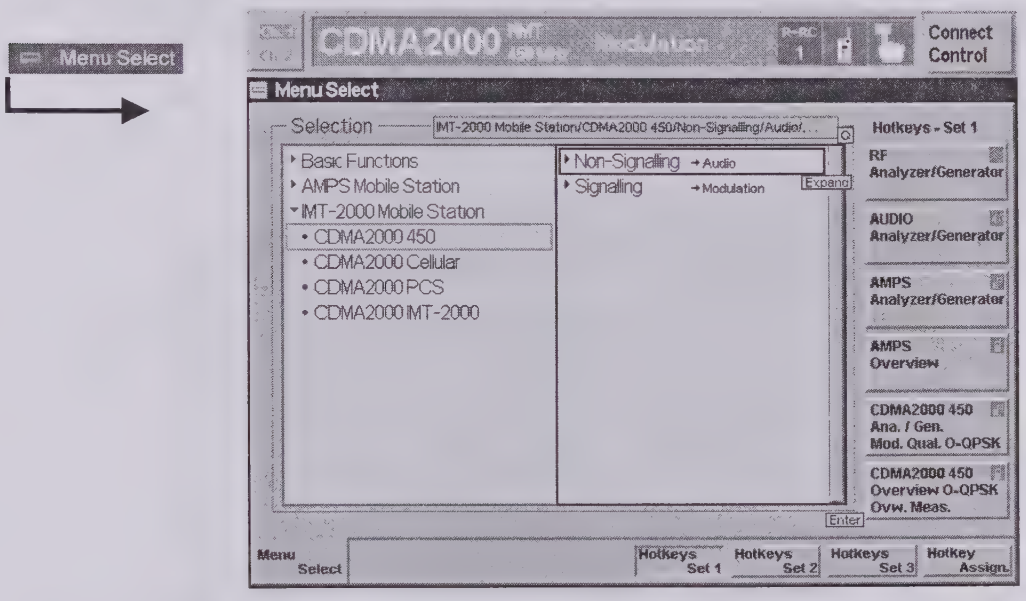

Menu Select
CDMA2000
Connect Control
Menu Select
Selection
IMT-2000 Mobile Station/CDMA2000 450/Non-Signalling/Audio/...
Basic Functions
AMPS Mobile Station
IMT-2000 Mobile Station
CDMA2000 450
CDMA2000 Cellular
CDMA2000 PCS
CDMA2000 IMT-2000
Non-Signalling → Audio
Signalling → Modulation
Expand
Enter
Hotkeys - Set 1
RF Analyzer/Generator
AUDIO Analyzer/Generator
AMPS Analyzer/Generator
AMPS Overview
CDMA2000 450 Ana. / Gen. Mod. Qual. O-QPSK
CDMA2000 450 Overview O-QPSK Ovw. Meas.
Menu Select
Hotkeys Set 1
Hotkeys Set 2
Hotkeys Set 3
Hotkey Assign.

Figure 4-1: Main Menu (Non-Signalling)

Analyzer/Generator Measurement Menu

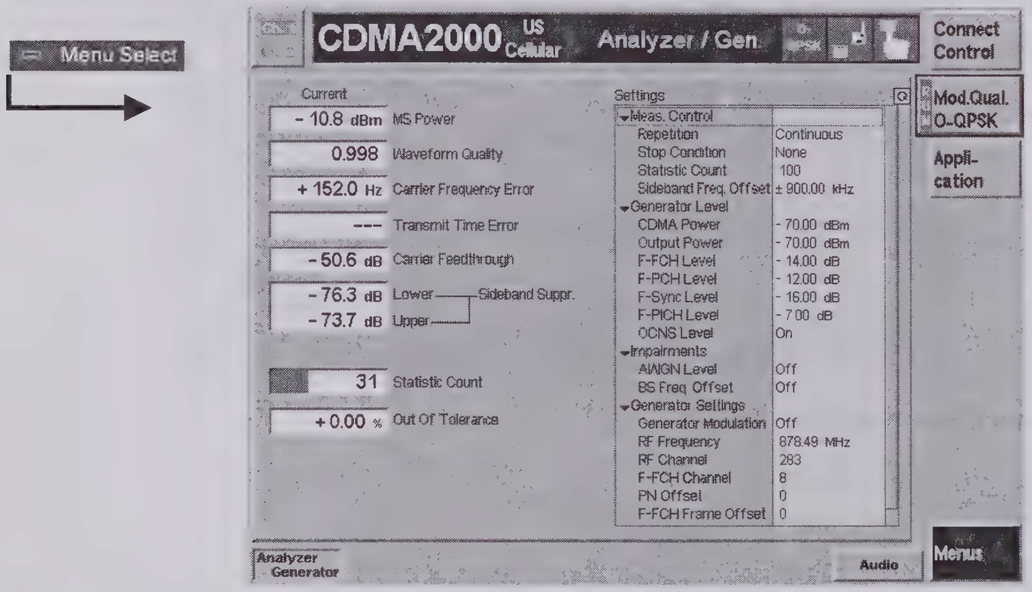
The *Analyzer/Generator* menu configures the signals of the RF generator and analyzer. At the same time, it controls the *Modulation* measurement and displays the current results.

To remain compatible with multiple mobile stations, the CMU200 supports several modulation schemes.

- O-QPSK Supports cdmaOne connections (radio configurations 1 and 2)
- HPSK Supports CDMA2000 connections (radio configurations 3 and 4)
- QPSK Supports CDMA2000 connections with only a Pilot channel.

> ***Note:*** *The screen shots provided for the Analyzer/Generator non-signalling mode were taken with the CMU200 set to the O-QPSK modulation scheme. Modulation scheme QPSK is also available but not shown.*

The main menu *Analyzer/Generator* is opened from the main menu *Menu Select* (with associated key at the front of the instrument).



Current	
- 10.8 dBm	MS Power
0.998	Waveform Quality
+ 152.0 Hz	Carrier Frequency Error
---	Transmit Time Error
- 50.6 dB	Carrier Feedthrough
- 76.3 dB	Lower — Sideband Suppr.
- 73.7 dB	Upper — Sideband Suppr.
31	Statistic Count
+ 0.00 %	Out Of Tolerance

Settings	
Meas. Control	
Repetition	Continuous
Stop Condition	None
Statistic Count	100
Sideband Freq. Offset	± 900.00 kHz
Generator Level	
CDMA Power	- 70.00 dBm
Output Power	- 70.00 dBm
F-FCH Level	- 14.00 dB
F-PCH Level	- 12.00 dB
F-Sync Level	- 16.00 dB
F-PICH Level	- 7.00 dB
OCNS Level	On
Impairments	
AWGN Level	Off
BS Freq. Offset	Off
Generator Settings	
Generator Modulation	Off
RF Frequency	878.49 MHz
RF Channel	283
F-FCH Channel	8
PN Offset	0
F-FCH Frame Offset	0

Figure 4-2: Measurement menu Analyzer / Generator

Softkey Selections

Mod. Qual. O-QPSK

The *Modulation Quality* softkey controls the *Modulation* measurement and indicates its status *(RUN | HLT | OFF).*

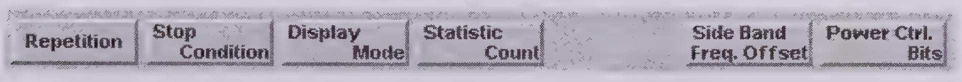
To change the status, press the *Modulation* softkey once and then use the front panel keys *ON/OFF* or *CONT/HALT*.

Pressing the *Modulation* softkey twice (once if already selected) opens the *Modulation Configuration* popup menu (refer to section *Modulation Configuration* in this chapter).

Remote control

```
INITiate:MODulation
ABORt:MODulation
STOP:MODulation
CONTINUE:MODulation
```

The measurement softkey activates a set of hotkeys to select a modulation application.



Repetition

The *Repetition* hotkey displays a popup window to select the repetition mode of the measurement between continuous and single shot.

Single Shot: The measurement is stopped after a statistic cycle, i.e. after the number of waveform intervals/evaluation periods set in the configuration menu *Statistics* . The *Stop Condition* setting may stop the measurement before completion of a cycle. A stopped measurement is indicated by the status display *HLT* in the measurement softkey.

Single shot should be selected if only a single measurement result is required under fixed conditions.

Continuous The CMU continues the measurement until it is terminated explicitly or until the stop condition is met. The measurement results are valid after one statistic cycle; however, the measurement is continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the measurement softkey.

The continuous measurement is suitable for monitoring the evolution of a measured quantity in time, for example when performing adjustments.

Remote control

```
CONFigure:MODulation:MQUality:OQPSk:CONTrol[?]
CONFigure:MODulation:MQUality:HPSK:CONTrol[?]
CONFigure:MODulation:MQUality:QPSK:CONTrol[?]
<Statistics>, <Repetition>, <Stop Cond>, <Step Mode>
```

Note: *In remote mode, the counting measurement (counting mode) is available as a further measurement mode with a defined number of measurement cycles to be performed, refer to chapter 6 of this manual.*

The Stop Condition setting can affect the Single Shot and Continuous repetition modes.

Stop Condition

The *Stop Condition* hotkey selects one of two stop conditions for the measurement:

NONE:	Continue measurement even if set limits have been exceeded.
On Limit Failure:	Stop measurement if a set limit has been exceeded (tolerance exceeded).

The stop conditions may affect single-shot and continuous measurement settings.

Remote control

```
CONFigure:MODulation:MQUality:OQPSk:CONTrol[?]
CONFigure:MODulation:MQUality:HPSK:CONTrol[?]
CONFigure:MODulation:MQUality:QPSK:CONTrol[?]
<Statistics>, <Repetition>, <Stop Cond>, <Step Mode>
```

Display Mode

The *Display Mode* hotkey sets which measurement values are displayed as a graph.

Current	Measured value for the current waveform interval.
Max/Min	Extreme value over a number of waveform intervals..
Average	Average value over a number of waveform intervals

The number of cycles for the calculation of the statistic values *Minimum/Maximum* and *Average* depends on the repetition mode set in the *Control* tab.

Single shot:	Display of minimum, maximum and average value from the performed statistic cycle.
Continuous:	Display of minimum and maximum values from all waveform intervals already measured. The average value refers to the last statistic cycle using a sliding window effect.

Side Band Freq. Offset

The *Side Band Freq. Offset* hotkey sets the frequency offset used for the sideband suppres power measurement.

Remote control

```
CONFigure:MODulation:MQUality:OQPSk:CONTrol:SBANd:FOFFset[?]
CONFigure:MODulation:MQUality:HPSK:CONTrol:SBANd:FOFFset[?]
CONFigure:MODulation:MQUality:QPSK:CONTrol:SBANd:FOFFset[?]
<Sideband Freq. Offset>
```

Statistic Count

The *Statistic Count* hotkey defines the number of waveform intervals per statistic cycle.

1 to 1000	Number of measurement intervals per statistic cycle.

Remote control

```
CONFigure:MODulation:MQUality:OQPSk:CONTrol[?]
CONFigure:MODulation:MQUality:HPSK:CONTrol[?]
CONFigure:MODulation:MQUality:QPSK:CONTrol[?]
<Statistics>, <Repetition>, <Stop Cond>, <Step Mode>
```

Power Ctrl. Bits

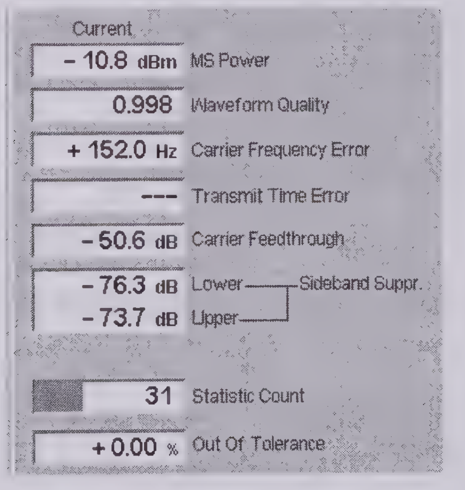
The *Power Ctl. Bits* hotkey displays a popup window to define how the power control bits are sent from the CMU to the mobile station. The power control bits control the mobile station's total output power (closed loop power control).

> **Note:** *Changing the Power Control Bits mode from AUTO could allow the mobile station's power level to change to a level where measurements can no longer be made.*

Auto	Auto mode is a closed loop operation and the proper power control bits are sent as needed to control the power level.
Hold	Hold mode sends alternating up/down power control bits.
All Down	All Down mode forces the power control bits to the down state.
All Up	All Up mode forces the power control bits to the up state.
Range Test	Range Test mode sends a sequence of UP power bits followed by a sequence of DOWN power bits.
Off	Off mode disables the power control bits and the bits are not sent to the mobile station.

Remote control `CONFigure:MODulation:MQUality:PCBits[?]` *`<Power Control Bits>`*

Measurement Results



Current

- 10.8 dBm MS Power

0.998 Waveform Quality

+ 152.0 Hz Carrier Frequency Error

--- Transmit Time Error

- 50.6 dB Carrier Feedthrough

- 76.3 dB Lower – Sideband Suppr.

- 73.7 dB Upper

31 Statistic Count

+ 0.00 % Out Of Tolerance

Figure 4-3: Measurement Display Results (Analyzer / Generator)

MS Power	*MS Power* is the total transmitted power level from the mobile station.
Waveform Quality	*Waveform Quality* is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal signal as defined in standard TIA/EIA-98.
Carrier Frequency	*Carrier Frequency Error* is the difference between the nominal frequency of the

Error	selected channel and the measured frequency.
Transmit Time Err.	*Transmission Time Error* is the time offset between the mobile station's signal and the CMU's signal.
Carrier Feedthrough	*Carrier Feedthrough* refers to the origin offset, which is the magnitude of the RF carrier relative to the magnitude of the modulated carrier.
Sideband Suppression	*Sideband Suppression* is a power measurement with a 30 kHz spectrum analyzer filter at a user configurable offset frequency used for spurious measurements.
Statistic Count	*Statistic Count* defines the length of the statistic cycles in waveform intervals/evaluation periods. *1 to 1000* Number of intervals per statistic cycle.
Out of Tolerance	*Out of Tolerance* is the percentage of waveform intervals that exceed the defined limits.

Remote control

```
READ[:SCALar]:MODulation[:RESult]?
FETCh[:SCALar]:MODulation[:RESult]?
SAMPle[:SCALar]:MODulation[:RESult]?
```

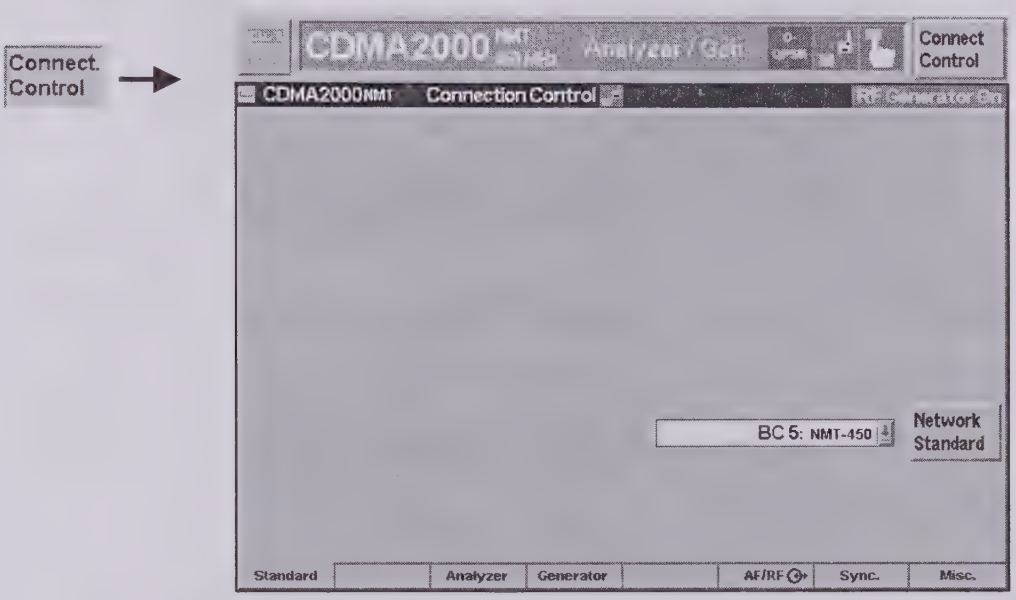
Connection Control in Non-Signalling

The menu group *Connection Control* while in the non-signalling mode, consists of popup menus to configure the inputs and outputs of the CMU and the respective signals in the function group *CDMA2000 Non-Signalling.*

The menu group is activated using the softkey *Connect Control* to the right of the header of the measurement menu. The individual popup menus can be accessed using the hotkeys at the bottom of the screen.

Network Standard (Connection Control – Standard)

The popup menu *Standard* defines which network and standard is used for testing.


Connect. Control
CDMA2000 NMT 450
Analyzer / Gen
Connect Control
CDMA2000NMT
Connection Control
RF Generator On
Standard
Analyzer
Generator
AF/RF
Sync.
Misc.

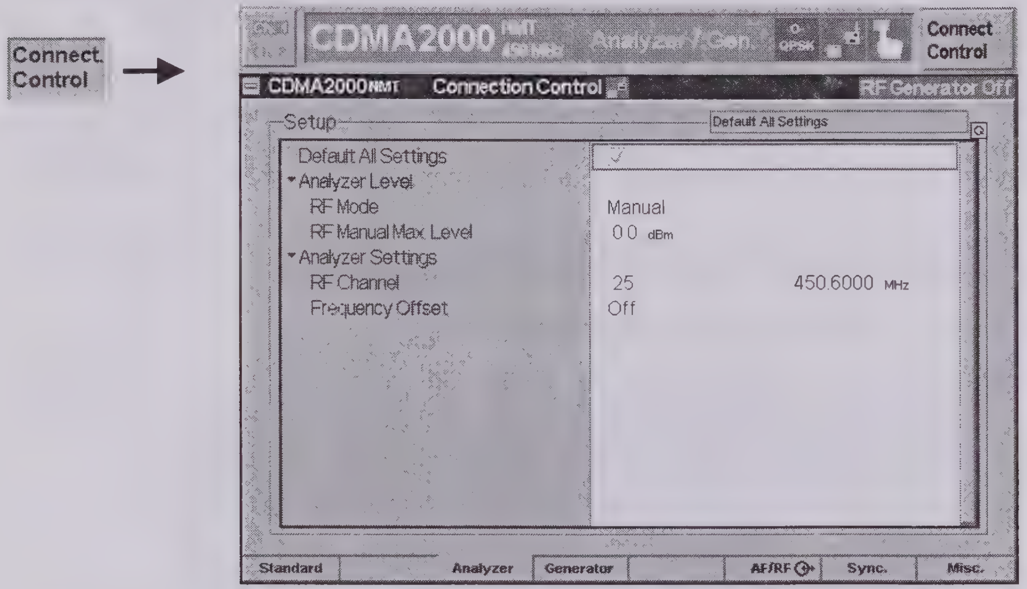
Network Standard: BC 5: NMT-450

Figure 4-4: Connection Control – Network

Refer to Table 4-1 on page 4.1 for a list of the supported CDMA2000 networks.

Analyzer Control (Connection Control – Analyzer)

The popup menu *Analyzer* configures the signals measured by the CMU.


Connect. Control
CDMA2000 NMT 450 MHz
Analyzer / Gen.
QPSK
Connect Control
CDMA2000 NMT
Connection Control
RF Generator Off
Default All Settings
Standard
Analyzer
Generator
AF/RF
Sync.
Misc.

Setup		
Default All Settings	✓	
Analyzer Level		
RF Mode	Manual	
RF Manual Max Level	0.0 dBm	
Analyzer Settings		
RF Channel	25	450.6000 MHz
Frequency Offset	Off	

Figure 4-5: Connection Control – Analyzer Settings

Default All Settings Check this box to reset all Generator settings to their default values.

Analyzer Level

RF Mode The *RF Mode* sets the analyzer mode to Auto or Manual.

Remote control
`[SENSe:]LEVel:MODE[?]`
`AUTO | MANual`

RF Manual Max. Level The *RF Manual Max. Level* sets the maximum expected input level.

The range of values depends on the RF input used. If an external input attenuation is reported to the instrument (see section RF Connectors (Connection Control – RF ⊖→) on page 4.16, all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the CMU. The level ranges for the input connectors are shifted as well.

Input levels exceeding the *RF Max. Level* can not be measured; the corresponding measurement result fields indicate "– – –".

Remote control
`[SENSe:]LEVel:MAXimum[?]`
`<RF Manual Max Level>`

Analyzer Settings

RF Channel	The *RF Channel* defines the base station channel number (and frequency) of the generated RF signal. The default settings for the channel numbers are dependent on the network selected. Changing the RF Channel also changes the RF Frequency setting. Table 4-1 on page 4.1 lists the networks and standards supported by the CMU with the CDMA2000 options.
Remote control	`[SENSe:]RFANalyzer:FREQuency[?]` *`<Frequency>`*
RF Channel Frequency Offset	The *RF Channel Frequency Offset* determines a frequency offset to impair the RF analyzer signal.
Remote control	`[SENSe:]RFANalyzer:FOFFset[?]` `<Analyzer Freq. Offset>`

Generator Control (Connection Control – Generator)

The popup menu *Generator* configures the signals generated by the CMU. Changes made here overwrite settings made via the hotkey popup windows.

Connect. Control →

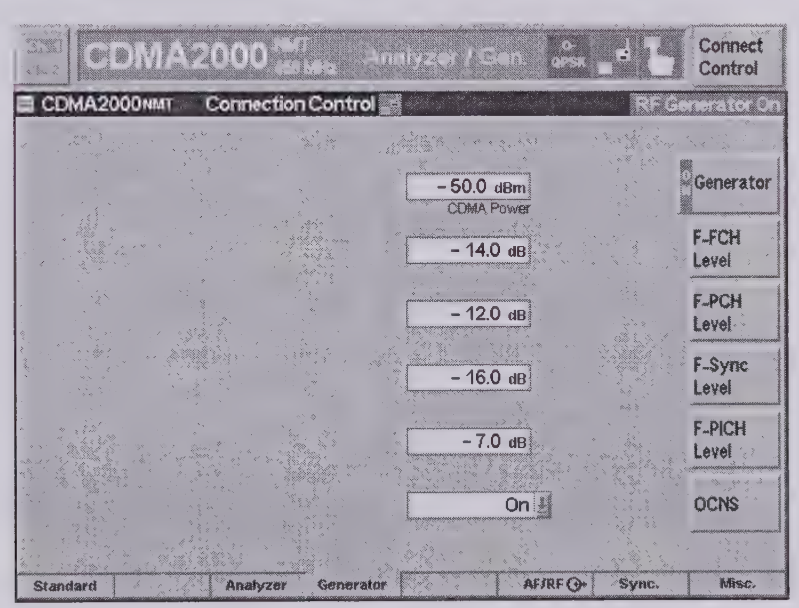

CDMA2000 NMT 450 MHz
Analyzer / Gen.
OPSK
Connect Control
CDMA2000NMT Connection Control
RF Generator On
-50.0 dBm
CDMA Power
-14.0 dB
-12.0 dB
-16.0 dB
-7.0 dB
On
Generator
F-FCH Level
F-PCH Level
F-Sync Level
F-PICH Level
OCNS
Standard
Analyzer
Generator
AF/RF
Sync.
Misc.

Figure 4-6: Connection Control – Generator settings (page one)

F-FCH Level	The *F-FCH Level* softkey adjusts the signal level of the Fundamental Channel in the forward CDMA channel.
Remote control	`SOURce:RFGenerator:LEVel:FFCH[?]` `<FFCH Level>`

F-PCH Level

The *F-PCH Level* softkey adjusts signal level of the Paging Channel in the forward CDMA channel relative to the total output power.

Remote control `SOURce:RFGenerator:LEVel:FPCH[?]`
`<FPCH Level>`

F-Sync Level

The *F-Sync Level* softkey adjusts the signal level of the Sync Channel in the forward CDMA channel.

Remote control `SOURce:RFGenerator:LEVel:FSYNc[?]`
`<FSYNC Level>`

F-PICH Level

The *F-PICH Level* softkey adjusts the signal level of the Pilot Channel in the forward CDMA channel.

Remote control `SOURce:RFGenerator:LEVel:FPICh[?]`
`<FPICH Level>`

OCNS

The *OCNS* softkey displays a popup window to turn the Orthogonal Channel Noise Simulator. Setting this to ON ensures a defined Output Power level.

Remote control `SOURce:RFGenerator:LEVel:OCNS:ENABle[?]`
`ON | OFF`

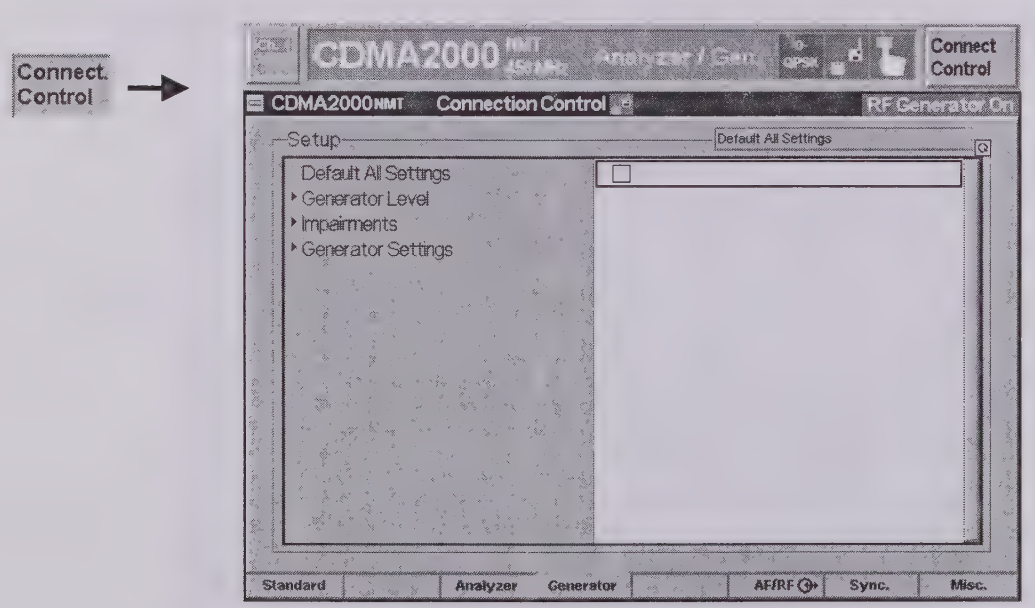

Connect. Control
CDMA2000
Analyzer / Gen
Connect Control
CDMA2000NMT Connection Control
RF Generator On
Setup
Default All Settings
Default All Settings
☐
Generator Level
Impairments
Generator Settings
Standard
Analyzer
Generator
AF/RF
Sync.
Misc.

Figure 4-7: Connection Control – Generator settings (page two)

Default All Settings Check this box to reset all Generator settings to their default values.

Generator Level

Generator Control — *Generator Control* changes the status of the RF generator (ON or OFF).

Remote control `INITiate:RFGenerator`
`ABORt:RFGenerator`

Gen. Modulation *Generator Modulation* selects the method used to modulate the generated RF signal. *AUTO* generates a CDMA2000 signal according to channel configuration. *OFF* generates an empty carrier signal (continuous wave).

Remote control `SOURce:RFGenerator:MODulation:MODe[?]`
`AUTO | OFF`

CDMA Power *CDMA Power* adjusts the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control `SOURce:RFGenerator:POWer:CDMA[?]`
`<CDMA Power>`

Output Power *Output Power* displays the total output power. The total Output Power level includes the AWGN power level.

Remote control `SOURce:RFGenerator:POWer:OUTput?`
`<Output Power>`

F-FCH Level *F-FCH Level* adjusts the signal level of the Fundamental Channel in the forward CDMA channel.

F-FCH Level specifies the FULL frame rate fundamental channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		**RC 2**		**RC 3, 4**		**RC 5**	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control `SOURce:RFGenerator:LEVel:FFCH[?]`
`<FFCH Level>`

F-PCH Level *F-PCH Level* adjusts the signal level of the Paging Channel in the forward CDMA channel relative to the total output power.

Remote control `SOURce:RFGenerator:LEVel:FPCH[?]`
`<FPCH Level>`

F-Sync Level *F-Sync Level* adjusts the signal level of the Sync Channel in the forward CDMA channel.

Remote control `SOURce:RFGenerator:LEVel:FSYNc[?]`
`<FSYNC Level>`

F-PICH Level *F-PICH Level* adjusts the signal level of the Pilot Channel in the forward CDMA channel.

Remote control

```
SOURce:RFGenerator:LEVel:FPICh[?]
<FPICH Level>
```

OCNS

OCNS turns the Orthogonal Channel Noise Simulator ON or OFF. Setting this to ON ensures a defined Output Power level.

Remote control

```
SOURce:RFGenerator:LEVel:OCNS:ENABle[?]
ON | OFF
```

Impairments

AWGN Level

AWGN Level turns on or off the Additive White Gaussian Noise generator and sets the level for modulation. This provides noise to more closely simulate actual operating conditions.

> ***Note:*** *The total output power of the CMU is the sum of the Forward CDMA signal plus the AWGN signal. The CMU automatically limits the AWGN signal level so that the maximum possible total output power of the CMU's RF connector is not exceeded.*

Remote control

```
SOURce:IMPairments:LEVel:AWGN[?]
<AWGN Level>
```

BS Freq. Offset

BS Freq. Offset adjusts the carrier frequency of the Base Station. This setting is disabled if the RF Frequency is adjusted away from a standard RF Channel frequency.

Remote control

```
SOURce:IMPairments:FOFFset[:RF][?]
<Freq. Offset>
```

Generator Settings

RF Channel

The *RF Channel* sets the base station channel number (and frequency) of the generated RF signal. Changing the RF Channel resets the RF Frequency setting.

The default settings for the channel numbers are dependent on the network selected.

Table 4-1 on page 4.1 lists the networks and standards supported by the CMU with the CDMA options.

Remote control

```
SOURce:RFGenerator:CHANnel:FFCH[?]
<FFCH Channel>
```

F-FCH Channel

F-FCH Channel sets the fundamental channel to use in the forward CDMA channel. The CMU automatically shifts an OCNS channel if channel conflicts occur. Changing this value causes a hard handoff to be performed (if a call is established). Refer to page 4.12 for more information on OCNS channels.

Remote control

```
SOURce:RFGenerator:CHANnel:FFCH[?]
<FFCH Channel>
```

F-FCH QOF

FCH QOF selects the Quasi-orthogonal Function that the Forward Fundamental Channel uses in the forward CDMA channel.

F-FCH Frame Offset	*F-FCH Frame Offset* sets the frame offset in the forward fundamental channel. Changing the frame offset immediately changes the traffic channel timing.
Remote control	`SOURce:RFGenerator:FROFfset:FFCH[?]` *`<Frame Offs>`*
F-FCH Frame Rate	*F-FCH Frame Rate* sets the frame rate to Full, Half, Quarter, or Eighth.
Remote control	`SOURce:RFGenerator:FRATe:FFCH[?]` *`<Frame Rate>`*
PN Offset	*PN Offset* sets the offset of the PN sequence. Changing the PN offset changes the timing of the pilot channel, the timing and contents of the sync channel message, and the long code mask of the paging channel.
Remote control	`SOURce:RFGenerator:PROPerty:PNOFfset[?]` *`<PN Offset>`*

RF Connectors (Connection Control – RF ⊸)

The popup menu RF ⊸ selects the connectors for RF signals. This includes defining:

- The RF input and output of the CMU (*RF Output*, *RF Input*).
- External attenuation at the connectors (*Ext. Att. Output*, *Ext. Att. Input*).

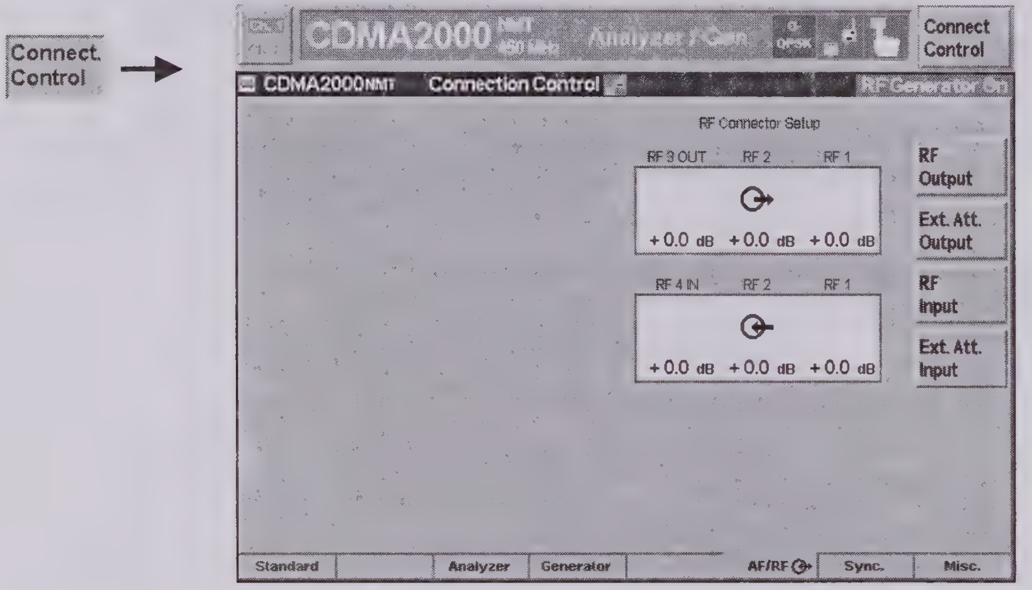

Connect. Control
CDMA2000 NMT 450 MHz
Analyzer / Gen
QPSK
Connect Control
CDMA2000NMT
Connection Control
RF Generator On
RF Connector Setup
RF 3 OUT
RF 2
RF 1
+0.0 dB
+0.0 dB
+0.0 dB
RF Output
Ext. Att. Output
RF 4 IN
RF 2
RF 1
+0.0 dB
+0.0 dB
+0.0 dB
RF Input
Ext. Att. Input
Standard
Analyzer
Generator
AF/RF ⊸
Sync.
Misc.

Figure 4-8: **Connection Control – RF connectors**

RF Output

The *RF Output* softkey defines which of the three connectors RF 1, RF 2 and RF 3 OUT is to be used as the RF output connector. The symbol ⊸ indicates the selected RF output.

> ***Note:*** *Input and output connectors can be arbitrarily combined. The bi-directional connectors RF 1 and RF 2 can be selected as RF inputs and outputs at the same time. The front panel LEDs are on (lit) if the generator is switched on or the modulation test is started.*

Remote control

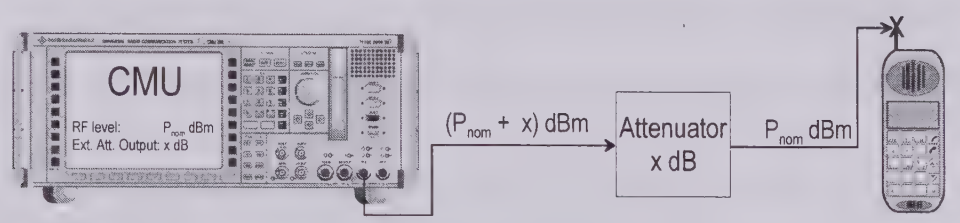
```
OUTPut[:STATe]
RF1 | RF2 | RF3
```

Ext. Att. Output

The *Ext. Att. Output* softkey defines an external attenuation (or gain, if the value is negative) at the selected RF output.

External attenuation is required if attenuation (such as a cable) is included in the test setup path, which is to be corrected by an increased signal level.

If an external attenuation is defined, the output signal level is referenced to the input of the device under test (DUT), the generator level is therefore shifted with respect to the actual level at the output connector of the CMU. The default value for the generator power and the level ranges for the RF outputs are also shifted provided that the generator can output the required power, compensating for the external attenuation or gain. Otherwise it is adapted to the level closest to the shifted default value.


CMU
RF level: P_{nom} dBm
Ext. Att. Output: x dB
$(P_{nom} + x)$ dBm
Attenuator
x dB
P_{nom} dBm

Remote control
`[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude]`
`SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude]`

RF Input

The *RF Input* softkey defines which of the three connectors RF 1, RF 2, or RF 4 IN is to be used as the RF input connector. The symbol ⊖ indicates the selected RF input.

> ***Note:*** *Input and output connectors can be arbitrarily combined. The bi-directional connectors RF 1 and RF 2 can be selected as RF inputs and outputs at the same time. The front panel LEDs are on (lit) if a measurement is active.*

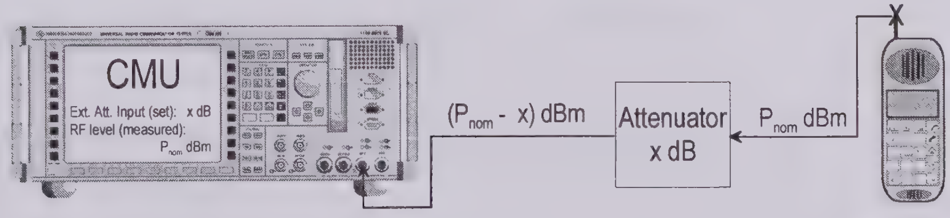
Remote control
`INPut[:STATe]`
`RF1 | RF2 | RF4`

Ext. Att. Input

The *Ext. Att. Input* softkey sets the value of the external attenuation (or gain) at the selected RF input.

Input of an external attenuation is required if, for example, external attenuator pads are used for protection of the sensitive RF inputs of the CMU or if path attenuation is included in the test setup.

If an external input attenuation is reported to the instrument, all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the CMU. The level ranges for the input connectors are shifted as well.


CMU
Ext. Att. Input (set): x dB
RF level (measured):
P_{nom} dBm
$(P_{nom} - x)$ dBm
Attenuator
x dB
P_{nom} dBm

Remote control
`[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]`
`SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]`

Reference Frequency (Connection Control – Sync.)

The popup menu *Sync.* defines the reference signals for synchronization. This includes:

- The internal or external Reference Frequency
- The output mode for the network-specific system clock (REF OUT 2)

Connect. Control →

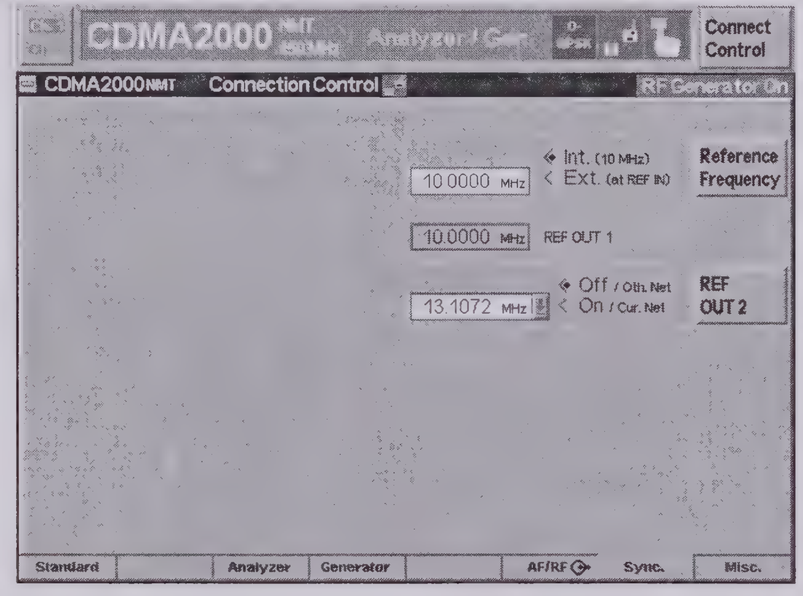

CDMA2000 NMT
Analyzer / Gen
Connect Control
CDMA2000NMT Connection Control
RF Generator On
Int. (10 MHz)
Ext. (at REF IN)
10.0000 MHz
Reference Frequency
10.0000 MHz
REF OUT 1
Off / Oth. Net
On / Cur. Net
13.1072 MHz
REF OUT 2
Standard
Analyzer
Generator
AF/RF
Sync.
Misc.

Figure 4-9: Connection Control – Synchronization

Reference Frequency

The *Reference Frequency* softkey determines the source and the frequency of the reference signal. Two selections are available.

Int. (10 MHz)	The internal 10 MHz clock signal (TCXO or OCXO, CMU-B11/-B12) is used for synchronization. This signal is available at the REF OUT 1 connector at the rear of the instrument.
Ext. (at REF IN)	An external reference signal is to be supplied to the *REF IN* connector. The frequency of the external reference signal must be entered in the input field.

The reference signal used is available at the *REF OUT 1* output connector at the rear of the instrument making it available for use by other instruments.

Notes:

1. *With external synchronization selected, a warning message cycles on and off if no synchronization has been performed e.g. because of missing or faulty input signal.*
2. *In the case of external synchronization with squarewave signals (TTL) ensure correct signal matching to avoid reflections. Otherwise, resulting overshoots may cause trigger problems at the CMU input. A possible remedy is to use a lowpass filter or an attenuator pad directly at the CMU input. Correct synchronization may be checked by comparing the signal REF OUT 1 or REF OUT 2 with the input signal.*
3. *This configuration is valid in all CMU function groups.*

Remote control `SOURce:DM:CLOCk:FREQuency <Frequency>`

RF Out 2

The *REF OUT 2* softkey configures a network-specific system clock available at the *REF OUT 2* output connector at the rear of the instrument.

The associated field allows selection between two settings:

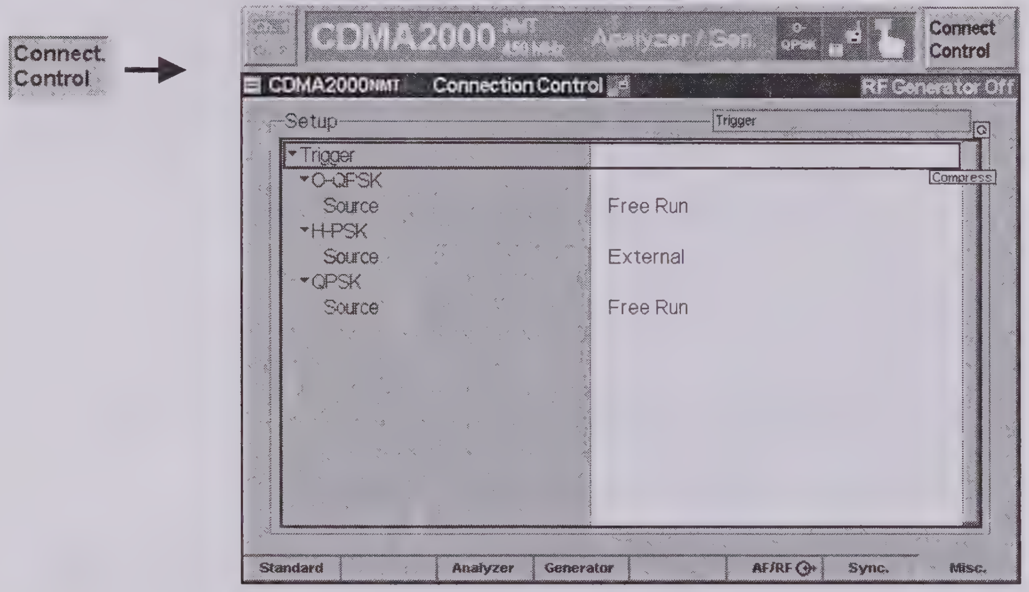
OFF (other network)	The clock frequency of another active function group is made available at the REF OUT 2 connector instead of the current function group. The REF OUT 2 must be switched on in the other function group.
On (current network)	The network-specific system clock of the current function group is available at the REF OUT 2 output connector.

The clock frequency can be used to synchronize other instruments.

Remote control `SOURce:DM:CLOCk:STATe ON | OFF`

Analyzer Control (Connection Control – Miscellaneous)

The popup menu *Misc.* configures general settings of the CMU such as the trigger source and the modulation dependent setting.


Connect. Control
CDMA2000 NMT 450 MHz
Analyzer / Gen
O-QPSK
Connect Control
CDMA2000NMT
Connection Control
RF Generator Off
Setup
Trigger
Compress
Standard
Analyzer
Generator
AF/RF
Sync.
Misc.

Trigger
- O-QPSK
  - Source: Free Run
- H-PSK
  - Source: External
- QPSK
  - Source: Free Run

Figure 4-10: Connection Control – Miscellaneous settings

Trigger

O-QPSK

Source	Source sets the CMU200 to use its internal signal trigger source or use an external trigger supplied via the AUX 3 connector on the front panel. The external trigger source is supplied via the AUX 3 connector on the front panel.

The trigger setting affects the results of the Transmit Time Error measurement as described here.

Freerun (O-QPSK)	No trigger. Timing error results are not possible.
Internal (O-QPSK and HPSK)	Timing error results are possible when DUT is correctly synced with the CMU.
External (O-QPSK and HPSK)	Timing error results are possible if an external trigger signal is provided and the DUT is correctly synced with the CMU.

Transmit Time Error measurement is not available for QPSK.

AUX 3 pin assignments

Output trigger signals

• Pin 2:	Sync Frame	26.67 ms
• Pin 3:	PP2S	2 s
• Pin 4:	Super Frame	80 ms
• Pin 5:	Paging Frame	20 ms

Input trigger

- Pin 8: Trigger Input

H-PSK

H-PSK has the same available trigger source settings as described for O-QPSK except for FREERUN.

QPSK

QPSK has the same available trigger source settings as described for O-QPSK.

Remote control

```
TRIGger[:SEQuence]:SOURce[:OQPSk][?]
TRIGger[:SEQuence]:SOURce:HPSK[?]
TRIGger[:SEQuence]:SOURce:QPSK[?]
INTernal | EXTernal | FRUN
```

CDMA Measurements

The structure of this section is based on the configuration and measurement groups defined in function group *CDMA2000 450 Signalling*. The menus are dealt with in the order of their display:

- Call setup to the mobile station (Connection Control – Signalling)
- Overview of measurements and general settings (Overview)
- Application menus (Overview, Power, Modulation, Receiver Quality): performance of the measurements, output of the measurement results, specific measurement configurations

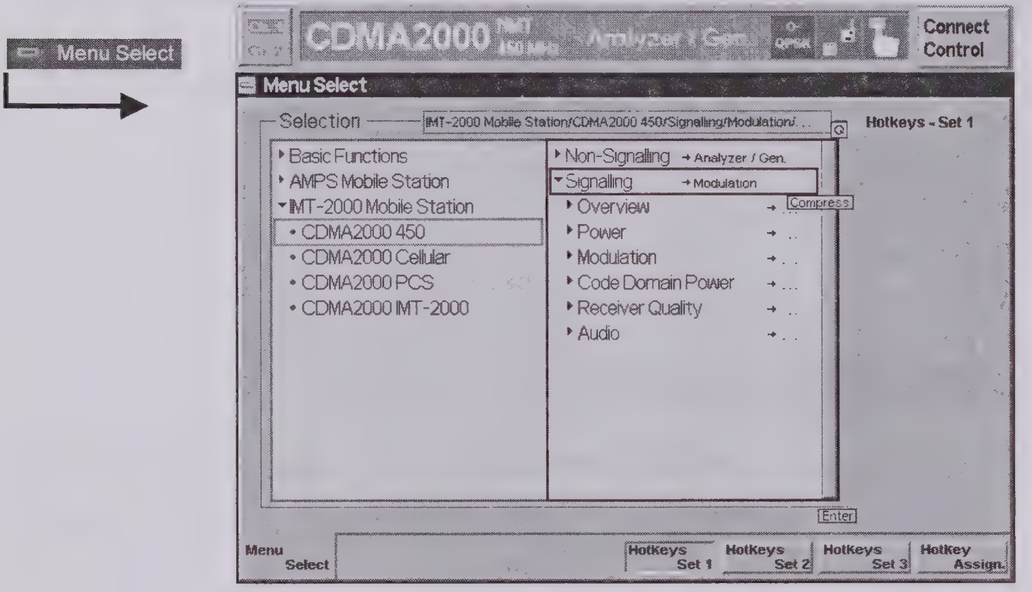

Menu Select
CDMA2000 IMT 450 MHz
Analyzer / Gen.
Connect Control
Menu Select
Selection
IMT-2000 Mobile Station/CDMA2000 450/Signalling/Modulation/...
Hotkeys - Set 1
Basic Functions
AMPS Mobile Station
IMT-2000 Mobile Station
CDMA2000 450
CDMA2000 Cellular
CDMA2000 PCS
CDMA2000 IMT-2000
Non-Signalling → Analyzer / Gen.
Signalling → Modulation
Overview
Power
Modulation
Code Domain Power
Receiver Quality
Audio
Compress
Enter
Menu Select
HotKeys Set 1
HotKeys Set 2
HotKeys Set 3
HotKey Assign.

Figure 4-11: CDMA applications in Signalling mode

Since making measurements requires a connection to a mobile station, the CMU200 immediately displays the *Connect Control* screen when selecting a CDMA2000 Signalling Mode.

Table 4-2: CDMA Networks Supported

CMU Options for CDMA	**Band Class**	**Network**
CMU-K83 450 MHz	Band Class 5	NMT-450
CMU-K84 Cellular	Band Class 0	US and Korean Cellular
	Band Class 2	TACS
	Band Class 3	JTACS
	Band Class 7	North American 700 MHz
	Band Class 9	900 MHz
	Band Class 10	Secondary 800 MHz
CMU-K85 PCS	Band Class 1	North American PCS
	Band Class 4	Korean PCS
	Band Class 8	1800 MHz
CMU-K86 IMT-2000	Band Class 6	IMT-2000

Call Setup (Connection Control)

The *Connection Control* popup menu controls the signalling (call setup and release, services, signalling parameters) and configures the inputs and outputs with the external attenuation values and the reference frequency.

Since the measurements in signalling mode require an existing connection to a mobile station, the menus for setting up the call (*Connection Control - Connection*) appear immediately after selecting a signalling mode (unless this feature is disabled). The connection control menus can be accessed any time by pressing the *Connect Control* softkey at the top right corner in any measurement menu. The hotkey bar (at the bottom the screen) links the measurement menus together. Pressing the *Escape* key or the *Connect Control* softkey closes the connection control menu and the CMU changes to the measurement mode.

> **Note:** *The automatic display or close of the* Connection Control *menu is controlled within the* User Guidance *section of the* Misc *tab of the* Connection Control *menus. See page 4.117.*

In the following, the tab *Connection Control – Connection* displayed during the call setup is described. The other tabs of the *Connection Control* menu are described at the end of this chapter beginning on page 4.98.

The term signalling summarizes all procedures necessary for call setup and release and for control of a connection in the mobile radio network. In the case of the CMU, a distinction is made between four different signalling states:

• Signal Off	CMU transmits no signal
• Signal On/MS Unregistered	CMU outputs a control channel signal to which a mobile station can synchronize
• Registered	Registration with the mobile station and location update performed
• Connected	Call established with a mobile station

A number of control commands which can be initiated both by the CMU *(Call initiated from the CMU)* and by the mobile station *(Call initiated from MS)* switch between these states.

Most applications within the function group *CDMA2000 Signalling* are only possible (or useful) in a particular signalling state (for example, handoff between various networks requires an existing connection between the CMU and mobile station, i.e. it is only possible in the *Connected* state). Functionality of some menus vary depending on the signalling state.

> **Note:** *A fifth signalling state (Alerting) exists if the Service Class is set to Speech Service.*

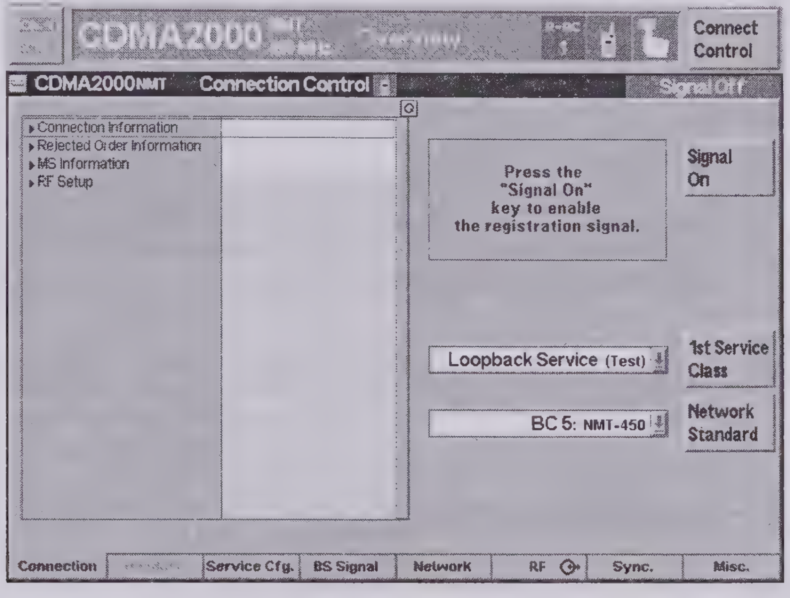
Corresponding to the possible signalling states, different *Connection* menus are available. When a signalling state is reached, the corresponding menu is opened automatically.

Connection Control (Signal Off State)

In the Signal Off state, the CMU does not output any RF signals. The popup menu *Connection (Signal Off)* provides the following information.

- The signalling parameters status.
- The most important parameters characterizing the frequency of the signal sent by the CMU in the *Signal On (BS Signal)* state.
- Activates the RF channel signal for the call setup to the mobile station *(Signal On)*.

Connect. Control →


CDMA2000
Connect Control
CDMA2000NMT Connection Control
Signal Off
Connection Information
Rejected Order Information
MS Information
RF Setup
Signal On
1st Service Class
Network Standard
Connection
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

Press the "Signal On" key to enable the registration signal.

Loopback Service (Test)

BC 5: NMT-450

Figure 4-12: Connect Control – Connection (Signal Off)

Header Message	A header Message displayed in each Connection index card provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Press the Signal On key to enable the registration signal` is displayed.
Information Window	This display window lists the current conditions of the connection to the mobile station. With the signal off, the mobile station cannot register so no information is displayed at this time.
Signal On	The *Signal On* softkey switches on the RF generator. Switching the RF generator on changes the Signalling state from the Signal Off state to the Signal On state and the CMU waits for the mobile station to register.
Remote control	`PROCedure:SIGNalling:ACTion` `SON`

1st Service Class

The *1st Service Class* softkey displays the call mode method to use when connecting to the mobile station. *Loopback Service* is generally used for testing. *Speech Service* is used to place a voice call to the mobile.

CDMA2000 receiver quality measurements require that a Loopback Service call be established with the mobile station. The Speech Service mode is used to place a voice call to the mobile. Modulation measurements may run slower in Speech Service since the mobile station signal may not be using Full Rate.

The parameters for the service types are configured in the *Service Config.* tab.

Remote control

```
CONFigure:SCONfig:SCLass[n]:SERVice[?]
PROCedure:SCONfig:SCLass[n]:SERVice[?]
LOOP | SPEech
```

Network Standard

The *Network Standard* softkey displays the Network selected from the *Menu Select* screen.

Pressing the *Network Standard* softkey allows you to change between the supported band classes for the network. Refer to Figure 4-11 on page 4.22 for a list of the supported CDMA2000 networks.

Remote control

```
CONFigure:NETWork:STANDard[?]
N45T |USC | KCEL | TACS | JTAC | NA7C | NA9C | NAS8 | NAPC |
KPCS | B18M | IM2K
```

Connection Control (Signal On State)

The menu *Connection Control Signal On* provides information on:

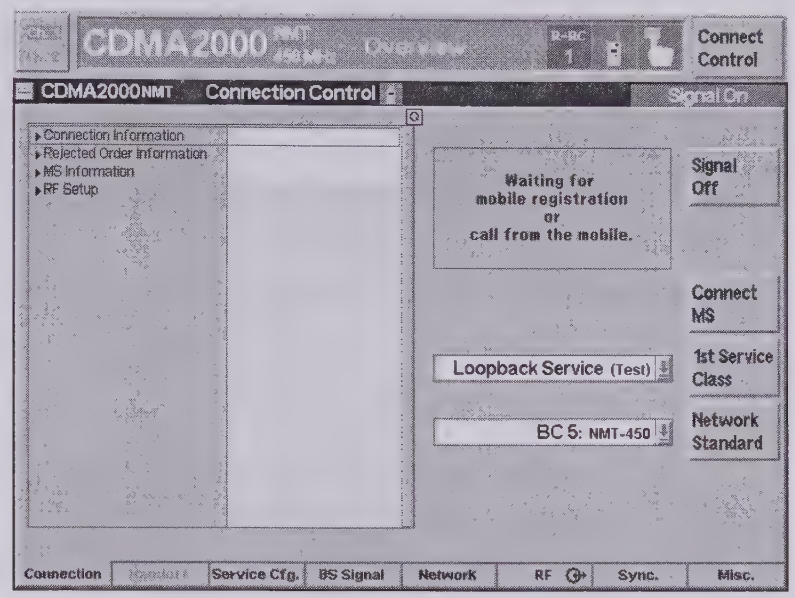
- Connection Information
- MS Information
- RF Setup
- Selected Service Class
- Selected Network Standard

It also contains softkeys leading to other signalling states:

- Deactivating the channel signals *(Signal Off)*
- Establishing a call to the mobile station if registration has taken place (*Connect MS* ⇒ state *Connected)*

The popup menu *Connection (Signal On)* is opened after activation of the signal on the CMU (Softkey *Signal On* in the popup menu *Connection (Signal Off)*). It is replaced by the *Connection* (*Registered)* menu if the mobile station registers with the CMU signal. It is replaced by the *Connection (Connected)* menu if the mobile station sets up a call to the CMU or if a mobile that is already registered is called via the *Connect MS* softkey.

Connect Control →


CDMA2000 NMT 450 MHz Overview
R-BC 1
Connect Control
CDMA2000NMT Connection Control
Signal On
Connection Information
Rejected Order Information
MS Information
RF Setup
Signal Off
Connect MS
1st Service Class
Network Standard
Connection
Handoff
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

Waiting for
mobile registration
or
call from the mobile.

1st Service Class: Loopback Service (Test)

Network Standard: BC 5: NMT-450

Figure 4-13: Connect Control – Connection (Signal On)

Header Message A header message displayed in each *Connection* index card provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Waiting for MS Registration or for MS to originate call` is displayed.

Mobile Info The signalling information box displays the mobile ID number.

Signal Off

The *Signal Off* softkey switches off the CMU's RF signal.

Switching the signal off causes the CMU to change to the *Signal Off* state.

Remote control `PROCedure:Signalling:ACTion SOFF`

Connect MS

The *Connect MS* softkey attempts to set up a call to the mobile station using the mobile ID from the previous registration. The type of call is dependent on the Service Class selected. If successful, the CMU goes to the Call Established state.

If the mobile ID does not match, a call will not be established.

If a call is established, the CMU displays the Call Established State. Refer to page 4.98.

If the mobile registers but fails to establish a call with the CMU, the CMU will display the *Connection Control Registered* screen. Refer to page 4.29.

Remote control `PROCedure:SIGNalling:ACTion CTM`

1st Service Class

The *1st Service Class* softkey displays the call mode method to use when connecting to the mobile station. *Loopback Service* is generally used for testing. *Speech Service* is used to place a voice call to the mobile.

CDMA2000 receiver quality measurements require that a Loopback Service call be established with the mobile station. The Speech Service mode is used to place a voice call to the mobile. Modulation measurements may run slower in Speech Service since the mobile station signal may not be using Full Rate.

The parameters for the service types are configured in the *Service Config.* tab.

Remote control

```
CONFigure:SCONfig:SCLass[n]:SERVice[?]
PROCedure:SCONfig:SCLass[n]:SERVice[?]
LOOP | SPEech
```

Network Standard

The *Network Standard* softkey displays the Network selected from the *Menu Select* screen.

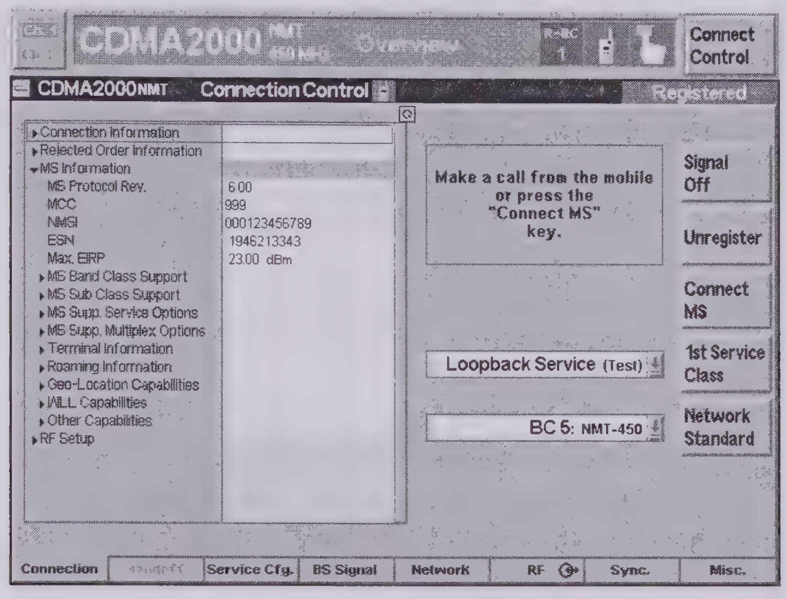
Pressing the *Network Standard* softkey allows you to change between the supported band classes for the network. Refer to Figure 4-11 on page 4.22 for a list of the supported CDMA2000 networks.

Remote control

```
CONFigure:NETWork:STANDard[?]
N45T |USC | KCEL | TACS | JTAC | NA7C | NA9C | NAS8 | NAPC |
KPCS | B18M | IM2K
```

Connection Control (Registered State)

Connect. Control →



CDMA2000NMT Connection Control Registered

- Connection Information
- Rejected Order Information
- MS Information
  - MS Protocol Rev. 6.00
  - MCC 999
  - NMSI 000123456789
  - ESN 1946213343
  - Max. EIRP 23.00 dBm
  - MS Band Class Support
  - MS Sub Class Support
  - MS Supp. Service Options
  - MS Supp. Multiplex Options
  - Terminal Information
  - Roaming Information
  - Geo-Location Capabilities
  - WLL Capabilities
  - Other Capabilities
- RF Setup

Make a call from the mobile or press the "Connect MS" key.

Loopback Service (Test)

BC 5: NMT-450

Figure 4-14: Connect Control – Connection (Registered)

Header Message A Header Message displayed in each *Connection* index card provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Make a call from the mobile or press the "Connect MS" key` is displayed.

MS Information In the Registered state, the display box contains the mobile station properties provided by the mobile station during registration.

Signal Off

The *Signal Off* softkey switches off the CMU's RF signal.

Switching the signal off causes the CMU to change to the signalling state Signal Off.

Remote control `PROCedure:Signalling:ACTion SOFF`

Unregister

The *Unregister* softkey unregisters the CMU from the mobile station and returns the CMU to the MS Unregistered state (refer to page 4.26).

Connect MS

The *Connect MS* softkey attempts to set up a call to the mobile station using the mobile ID from the previous registration. If successful, the CMU goes to the Call Established state.

If the mobile ID does not match, a call will not be established.

If a call is established, the CMU displays the Connected State. Refer to page 4.98.

If the mobile registers but fails to establish a call with the CMU, the CMU remains in the *Connection Control Registered* screen.

Remote `PROCedure:SIGNalling:ACTion`

control `CTM`

1st Service Class

The *1st Service Class* softkey displays the call mode method to use when connecting to the mobile station. *Loopback Service* is generally used for testing. *Speech Service* is used to place a voice call to the mobile.

CDMA2000 receiver quality measurements require that a Loopback Service call be established with the mobile station. The Speech Service mode is used to place a voice call to the mobile. Modulation measurements may run slower in Speech Service since the mobile station signal may not be using Full Rate.

The parameters for the service types are configured in the *Service Config.* tab.

Remote control

```
CONFigure:SCONfig:SCLass[n]:SERVice[?]
PROCedure:SCONfig:SCLass[n]:SERVice[?]
LOOP | SPEech
```

Network Standard

The *Network Standard* softkey displays the Network selected from the *Menu Select* screen.

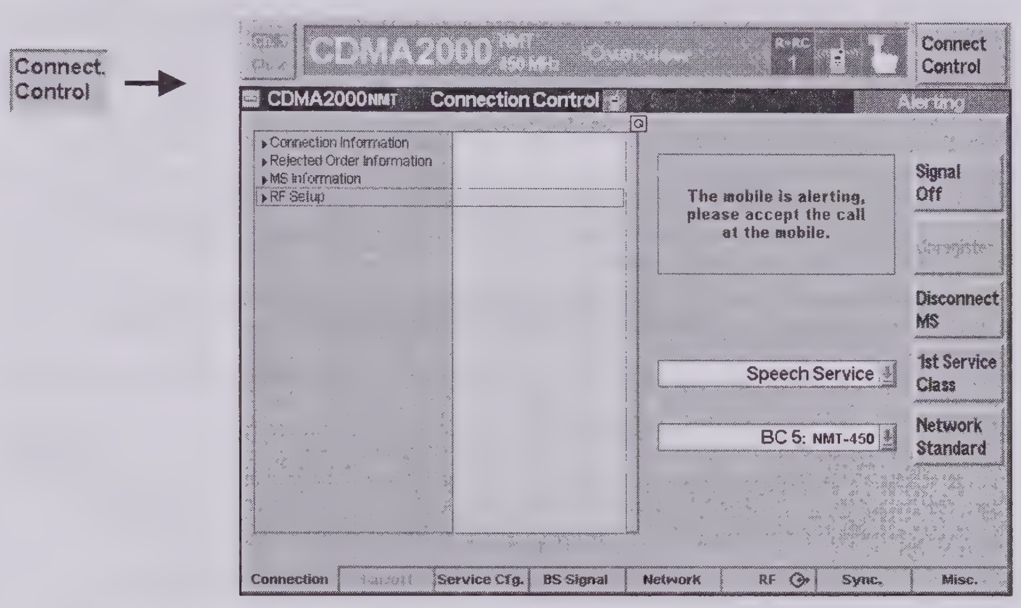
Pressing the *Network Standard* softkey allows you to change between the supported band classes for the network. Refer to Figure 4-11 on page 4.22 for a list of the supported CDMA2000 networks.

Remote control

```
CONFigure:NETWork:STANDard[?]
N45T |USC | KCEL | TACS | JTAC | NA7C | NA9C | NAS8 | NAPC |
KPCS | B18M | IM2K
```

Connection Control (Alerting State)

The Alerting state is reached in the 1^{st} Service Class is set to Speech Service to establish a voice call to the mobile station. In this state, the mobile station is ringing and the call needs to be answered to connect to the mobile station.


Connect. Control
CDMA2000
Connect Control
CDMA2000NMT
Connection Control
Alerting
Connection Information
Rejected Order Information
MS Information
RF Setup
Signal Off
Disconnect MS
1st Service Class
Network Standard
Connection
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

The mobile is alerting, please accept the call at the mobile.

Speech Service

BC 5: NMT-450

Figure 4-15: Connect Control – Connection (Alerting)

Header Message A header Message displayed in each *Connection* index card provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `The mobile is alerting. Please accept the call at the mobile.` is displayed.

Refer to the Connection Control (Registered) for a description of the softkeys.

Overview of the Function Group

The *Overview* main menu provides an overview of the function group *CDMA2000 Signalling*, the current measurement status, and the most important scalar parameters and measurement results.

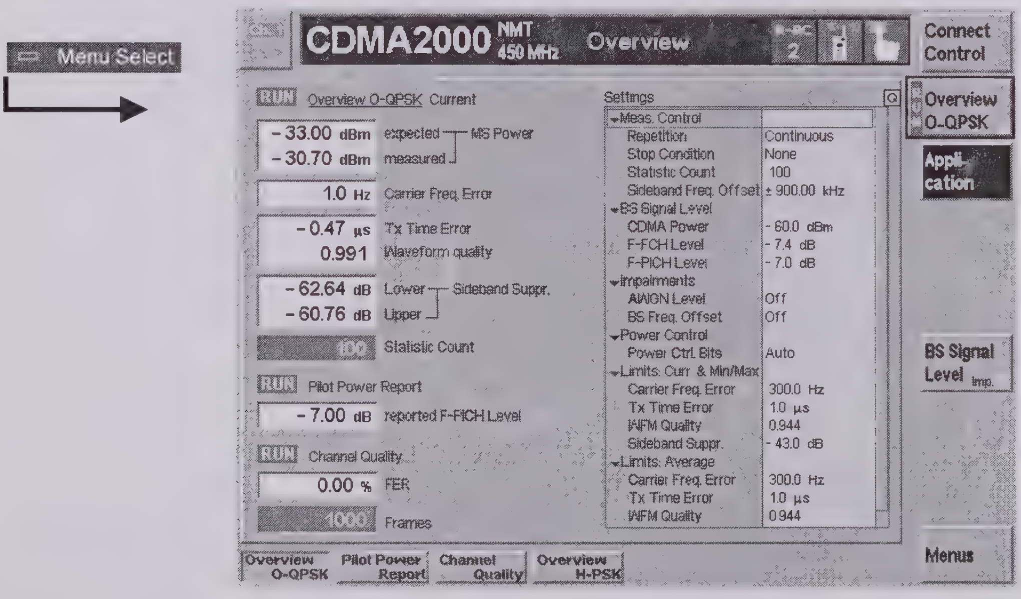
The *Overview* menu can be opened from the main menu *Menu Select* (with associated key at the front of the instrument). From here, the *Connection Control* menus are accessible as well as all measurement menus using the hotkeys at the bottom of the screen.

Note: *The configuration settings made while in the* Overview *application (with either the softkeys or the* Overview Configuration *menus) applies only to the measurements presented here. For example, the Overview measurement screen provides some power and modulation measurements but the configuration settings made here do not affect the configuration settings made within the* Power *or* Modulation *applications.*

Each measurement has its own test setup environment. The measurement's environment overrides respective parameters in the Connection Control menus as long as the measurement is not switched OFF.

Note: *The Overview application is available for both O-QPSK and H-PSK modulation schemes. The CMU automatically selects the correct modulation scheme unless this feature is disabled in the Misc. tab of the Connection Control screen. Refer to User Guidance on page 4.117.*

The screen shots and discussions in this chapter refer to O-QPSK but apply to both modulation schemes.



RUN Overview O-QPSK Current

- 33.00 dBm expected — MS Power
- 30.70 dBm measured — MS Power
1.0 Hz Carrier Freq. Error
- 0.47 µs Tx Time Error
0.991 Waveform quality
- 62.64 dB Lower — Sideband Suppr.
- 60.76 dB Upper — Sideband Suppr.
100 Statistic Count

RUN Pilot Power Report

- 7.00 dB reported F-PICH Level

RUN Channel Quality

0.00 % FER
1000 Frames

Settings

Meas. Control	
Repetition	Continuous
Stop Condition	None
Statistic Count	100
Sideband Freq. Offset	± 900.00 kHz
BS Signal Level	
CDMA Power	- 60.0 dBm
F-FCH Level	- 7.4 dB
F-PICH Level	- 7.0 dB
Impairments	
AWGN Level	Off
BS Freq. Offset	Off
Power Control	
Power Ctrl. Bits	Auto
Limits: Curr. & Min/Max	
Carrier Freq. Error	300.0 Hz
Tx Time Error	1.0 µs
WFM Quality	0.944
Sideband Suppr.	- 43.0 dB
Limits: Average	
Carrier Freq. Error	300.0 Hz
Tx Time Error	1.0 µs
WFM Quality	0.944

Figure 4-16: Function overview – Main menu overview

The left side reports three measurement types:

- Overview O-QPSK (or HPSK)
    - MS Power
    - Carrier Frequency Error

  - Transmit Time Error
  - Waveform Quality
  - Sideband Suppression
  - Statistic Count
- Pilot Power Report
  - *Pilot Power Report* displays the F-PICH pilot power reported from the mobile
- Channel Quality

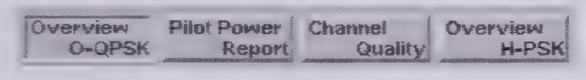
Channel Quality starts the Receiver Quality measurement and displays the frame error rate and the number of frames transmitted. The measurement results are discussed under *Receiver Quality Measurements* beginning on page 4.69.

The *Settings* window displays the current configuration settings.

The remaining softkeys are describe below.

Appli-cation

The *Application* softkey displays the available measurement functions.



Each measurement type can be turn on or off by selecting the hotkey and pressing the ON/OFF key or halted by pressing the CONT/HALT key.

BS Signal Level

The *BS Signal Level / Imp.* softkey toggles between two sets of hotkeys to adjust the signal impairments and the base station signal levels.

CDMA Power

The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control

```
CONFigure:BSSignal:POWer:CDMA[?]
PROCedure:BSSignal:POWer:CDMA[?]
<CDMA Power>
```

F-FCH Level

The *F-FCH Level* hotkey adjusts the signal level of the Fundamental Channel in the forward CDMA channel.

The *F-FCH Level* specifies the FULL frame rate fundamental channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		RC 2		RC 3, 4		RC 5	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control

```
CONFigure:BSSignal:LEVel:FFCH[?]
PROCedure:BSSignal:LEVel:FFCH[?]
<FFCH Level>
```

F-PICH Level

The *F-PICH Level* hotkey adjusts the signal level of the Pilot Channel in the forward CDMA channel relative to the total output power.

Remote control

```
CONFigure:BSSignal:LEVel:FPCH[?]
PROCedure:BSSignal:LEVel:FPCH[?]
<FPCH Level>
```

Impairm.

The *Impairm. / BS Sig Lvl.* softkey toggles between two sets of hotkeys to adjust the signal impairments and the base station signal levels.

AWGN

AWGN Level turns on or off the Additive White Gaussian Noise generator and set the level for modulation. This provides noise to more closely simulate actual operating conditions.

> ***Note:*** *The total output power of the CMU is the sum of the Forward CDMA signal plus the AWGN signal. The CMU automatically limits the AWGN signal level so that the maximum possible total output power of the CMU's RF connector is not exceeded.*

Remote control

```
CONFigure:IMPairments:LEVel:AWGN[?]
<AWGN Level>
```

BS Freq. Offset

The *BS Freq. Offset* hotkey adjusts the carrier frequency of the Base Station.

Remote control

```
CONFigure:IMPairments:FOFFset[:RF][?]
<Freq. Offset>
```

Overview Configuration

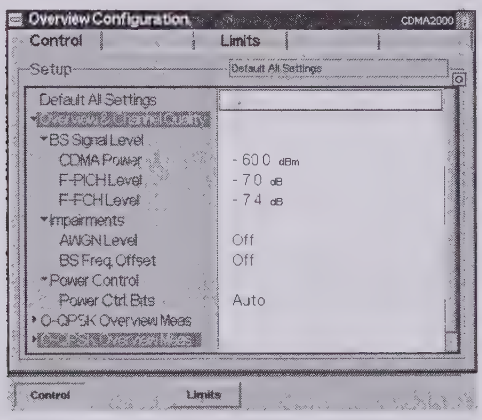
The popup menu *Overview Configuration* contains tabs that define the parameters of the modulation measurements and the limits (error tolerances).

Pressing the measurement softkey twice (once if already selected) opens the popup menu *Overview Configuration*. Press the associated hotkeys to change between tabs. Use the EXP/CMP key to expand or compress the list of settings displayed.

> ***Note:*** *The Overview application is available for both O-QPSK and H-PSK modulation schemes. The CMU automatically selects the correct modulation scheme unless this feature is disabled in the Misc. tab of the Connection Control screen. Refer to User Guidance on page 4.117.*
>
> *The screen shots and discussions in this chapter refer to O-QPSK but apply to both modulation schemes.*

Overview Configuration – Control

The *Control* tab controls the modulation measurement applications. The menus contain configurations that affect all modulation measurements and settings for individual modulation measurements.



Default All Settings
▾Overview & Channel Quality
▾BS Signal Level
CDMA Power -60.0 dBm
F-PICH Level -7.0 dB
F-FCH Level -7.4 dB
▾Impairments
AWGN Level Off
BS Freq. Offset Off
▾Power Control
Power Ctrl. Bits Auto
▸O-QPSK Overview Meas
▸H-PSK Overview Meas

Figure 4-17: Overview control configuration

Default All Settings	*Default All Settings* assigns default values to all parameters of the *Control* tab.
BS Signal Level	
CDMA Power	*CDMA Power* sets the total CDMA output power. The CDMA Power level does not include the AWGN power level.
Remote Control	`CONFigure:OVERview:MCQuality:CONTrol:POWer:CDMA[?]` *`<CDMA Power>`*
F-FCH Level	The *F-FCH Level* adjusts the signal level of the Fundamental Channel in the forward CDMA channel. The *F-FCH Level* specifies the FULL frame rate traffic channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		RC 2		RC 3, 4		RC 5	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote Control

```
CONFigure:OVERview:MCQuality:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

F-PICH Level

F-PICH Level adjusts the signal level of the Pilot Channel in the forward CDMA channel.

Remote Control

```
CONFigure:OVERview:MCQuality:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

Impairments

AWGN Level

AWGN Level turns on the Additive White Gaussian Noise generator. Refer to page 4.34 for additional information.

Remote Control

```
CONFigure:OVERview:MCQuality:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

BS Frequency Offset

BS Frequency Offset adjusts the carrier frequency of the Base Station.

Remote Control

```
CONFigure:OVERview:MCQuality:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

Power Control

Power Control Bits

Power Control Bits defines how the power control bits are sent from the CMU to the mobile station. The power control bits control the mobile station's total output power (closed loop power control).

Note: *Changing the Power Control Bits mode from AUTO could allow the mobile station's power level to change to a level where measurements can no longer be made.*

Auto	*Auto* mode is a closed loop operation and the proper power control bits are sent as needed to control the power level.
Hold	*Hold* mode sends alternating up/down power control bits.
All Down	*All Down* mode forces the power control bits to the down state. This will cause the mobile station's power level to decrease to a level too low for measurements to be made.
All Up	*All Up* mode forces the power control bits to the up state.
Range Test	Range Test mode sends a sequence of UP power bits followed by a sequence of DOWN power bits.
Off	*Off* mode disables the power control bits and the bits are not sent to the mobile station.

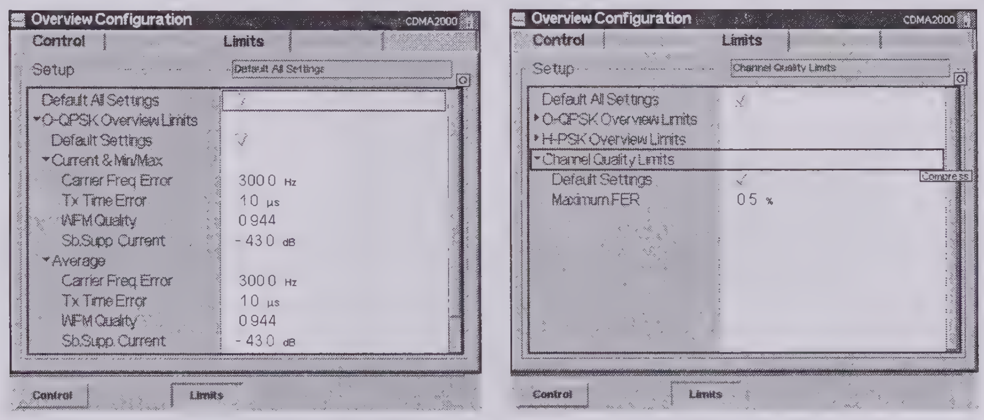
Remote Control	`CONFigure:OVERview:MCQuality:PCBits[?]` `OFF | AUTO | HOLD | ADOW | AUP | RTES`

Overview Configuration – Limits

The *Limits* tab allows you to set the limits for the overview measurements. Two sets of limits are configurable for each measurement: the Current and Maximum/Minimum measurement limits and the Average measurement limits.

Note: *The Overview application is available for both O-QPSK and H-PSK modulation schemes. The CMU automatically selects the correct modulation scheme unless this feature is disabled in the Misc. tab of the Connection Control screen. Refer to User Guidance on page 4.117.*

The screen shots and discussions in this chapter refer to O-QPSK but apply to both modulation schemes.



Setup: Default All Settings

Default All Settings ✓
O-QPSK Overview Limits
  Default Settings ✓
  Current & Min/Max
    Carrier Freq Error 300.0 Hz
    Tx Time Error 1.0 µs
    WFM Quality 0.944
    Sb.Supp Current -43.0 dB
  Average
    Carrier Freq Error 300.0 Hz
    Tx Time Error 1.0 µs
    WFM Quality 0.944
    Sb.Supp Current -43.0 dB

Setup: Channel Quality Limits

Default All Settings ✓
O-QPSK Overview Limits
H-PSK Overview Limits
Channel Quality Limits
  Default Settings ✓
  Maximum FER 0.5 %

Figure 4-18: Overview limits configuration display

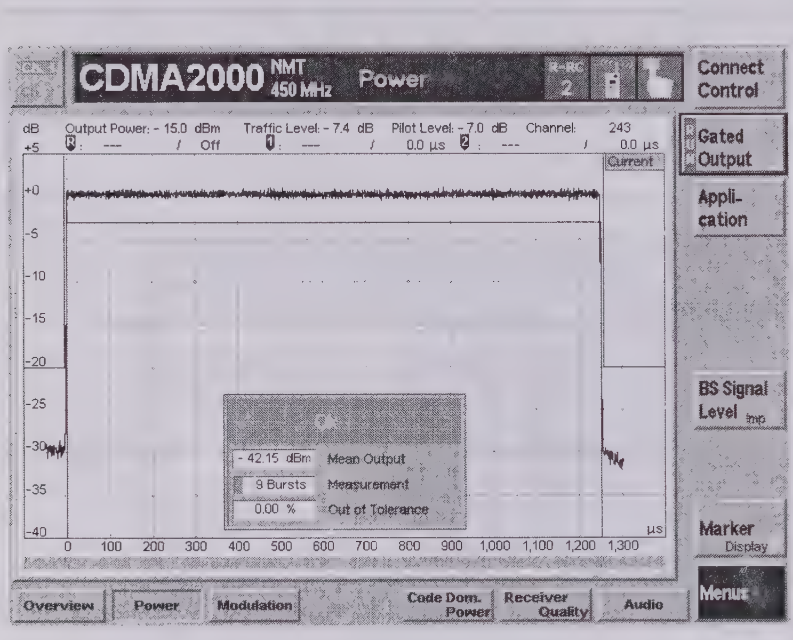
Default All Settings	The *Default All Settings* switch assigns default values to all parameters of the modulation *Limits* tab.
Default Settings	*Default Settings* assigns default values to all parameters of the *Limits* tab for all modulation measurements reported in the Overview display.
Current & Max/Min	*Current and Max/Min* sets the limits for the measured values in the current waveform interval or of the extreme values of all measured waveform intervals (Min/Max).
Average	*Average* sets the limits are for the average value of the measured values derived from the last statistic cycle.

Power Measurements

The menu group *Power* contains the functions to measure the received signal power. The *Power Configuration* popup menu configures all power measurements.

The *Power* menu is typically opened using the hotkey *Power* (see Figure 4-19). The initial screen returns to the power application last accessed.

> ***Note:*** *This menu is also accessible from the main menu screen by pressing the* Menu Select *front panel key and selecting CDMA>Signalling>Power.*



Output Power: - 15.0 dBm

Traffic Level: - 7.4 dB

Pilot Level: - 7.0 dB

Channel: 243

R: --- / Off

1: --- / 0.0 µs

2: --- / 0.0 µs

- 42.15 dBm Mean Output

9 Bursts Measurement

0.00 % Out of Tolerance

CDMA2000
NMT
450 MHz
Power
R-RC
2
Connect Control
Gated Output
Appli- cation
BS Signal Level
Marker Display
Menus
dB
+5
+0
-5
-10
-15
-20
-25
-30
-35
-40
Current
µs
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
Overview
Power
Modulation
Code Dom. Power
Receiver Quality
Audio

Measurement softkey

Figure 4-19: Power measurement menu (Gated Output displayed)

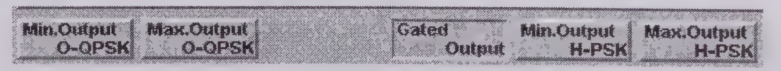
The measurement softkey indicates the current power application and its status (*RUN* | *HLT* | *OFF*). This softkey also opens and closes the *Power Configuration* menu. The power measurements configuration description begins on page 4.48.

Softkey Selections

Each power measurement provides similar softkey and hotkey menu selections. The softkeys and hotkeys common to all power applications are described here. Softkeys specific to an application are described within the application topic.

Appli-cation

The *Application* softkey activates a set of hotkeys to select a power measurement. When an application is selected, the corresponding measurement screen is displayed.



Min.Output O-QPSK
Max.Output O-QPSK
Gated Output
Min.Output H-PSK
Max.Output H-PSK

Min. Output O-QPSK

The *Minimum Output* hotkey changes the power measurement application to measure the minimum power output of the mobile station for the Offset Quadrature Phase Shift Keying modulation scheme.

Remote control

```
INITiate:POWer:MIOutput[:OQPSk]
ABORt:POWer:MIOutput[:OQPSk]
STOP:POWer:MIOutput[:OQPSk]
CONTinue:POWer:MIOutput[:OQPSk]
```

Max. Output O-QPSK

The *Maximum Output* hotkey changes the power measurement application to measure the maximum power output of the mobile station for the Offset Quadrature Phase Shift Keying modulation scheme.

Remote control

```
INITiate:POWer:MAOutput[:OQPSk]
ABORt:POWer:MAOutput[:OQPSk]
STOP:POWer:MAOutput[:OQPSk]
CONTinue:POWer:MAOutput[:OQPSk]
```

Gated Output

The *Gated Output* hotkey changes the power measurement to display the time response of the mean output power for isolated gated-on power control groups.

Remote control

```
INITiate:POWer:GOUTput
ABORt:POWer:GOUTput
STOP:POWer:GOUTput
CONTinue:POWer:GOUTput
```

Min. Output HPSK

The *Minimum Output HPSK* hotkey changes the power measurement application to measure the minimum power output of the mobile station for the Hybrid Phase Shift Keying modulation scheme.

Remote control

```
INITiate:POWer:MIOutput:HPSK
ABORt:POWer:MIOutput:HPSK
STOP:POWer:MIOutput:HPSK
CONTinue:POWer:MIOutput:HPSK
```

Max. Output HPSK

The *Maximum Output* hotkey changes the power measurement application to measure the maximum power output of the mobile station for the Hybrid Phase Shift Keying modulation scheme..

Remote control

```
INITiate:POWer:MAOutput:HPSK
ABORt:POWer:MAOutput:HPSK
STOP:POWer:MAOutput:HPSK
CONTinue:POWer:MAOutput:HPSK
```

Impairm.

The *Impairm. / BS Sig Lvl.* softkey toggles between two sets of hotkeys to adjust the signal impairments and the base station signal levels. Refer to the specific application for details about each hotkey.

Marker

The *Marker/Display* softkey positions up to three markers and a baseline (D-Line) in the test diagram and outputs their values. Refer to page 4.118 for detailed information about markers.

Menus

The *Menus* softkey displays the hotkey bar for switching to the other measurement menus.

Measurement Results

The CMU measures power by calculating the average power over a measurement interval. The measurement interval is 1229.5 chip intervals (0.5 ms).

The *Minimum Output* application measures the mobile station's minimum output power. The screen displays a table of the measured values of the total channel power and the waveform quality of the signal.

The *Maximum Output* application measures the mobile station's maximum output power. The screen displays a table of the measured values of the total channel power and the waveform quality of the signal.

The *Gated Output* application measures the time response of the mean output power for isolated gated-on power control groups.

Measurement results are explained for each application.

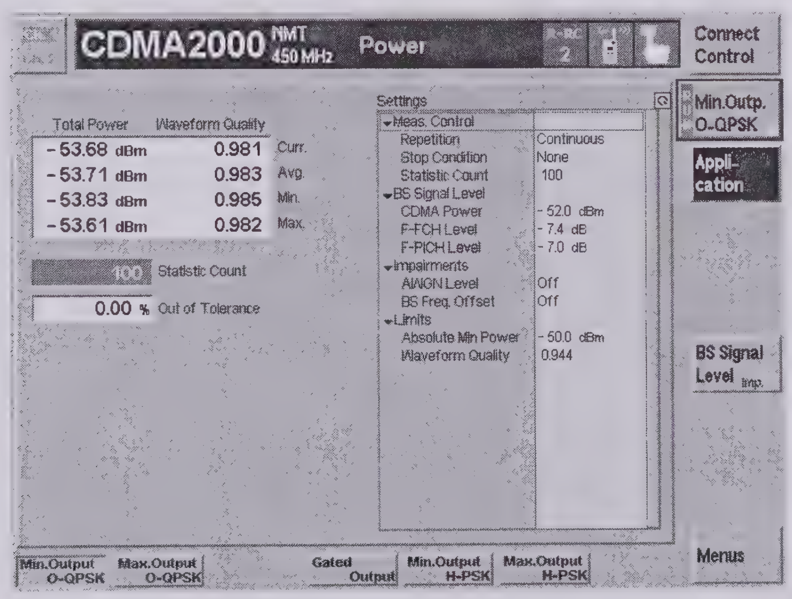
Minimum Output

The *Minimum Output* application is available for both O-QPSK and HPSK modulation schemes. The screen shots and discussions refer to O-QPSK but apply to both modulation schemes.

The *Minimum Output* application instructs the mobile station to reduce its output power to its minimum level. (This is in part done by setting the power control bits to the All Down mode.) The screen displays four measured values of the total channel power and the waveform quality of the signal. The application uses the values selected for CDMA Power, Traffic Level, and Pilot Level accessed either by the *BS Signal Level* softkey or in the *Control* tab of the *Power Configuration* menu.

The following values are returned for Total Power and Waveform Quality:

- Current is the current values of the measurement interval.
- Maximum and Minimum are the extreme values (and their polarity) of the power of all measurement intervals since the measurement started. Waveform quality measurements of the minimum and maximum power measurements are made at the time of the extreme values.
- Average is the value of a number of measurement intervals averaged together (defined by the *Measurement Count* setting).
- Waveform Quality is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal O-QPSK/HPSK signal as defined in standard TIA/EIA-98.



Total Power	Waveform Quality	
- 53.68 dBm	0.981	Curr.
- 53.71 dBm	0.983	Avg.
- 53.83 dBm	0.985	Min.
- 53.61 dBm	0.982	Max.

100 Statistic Count

0.00 % Out of Tolerance

Settings	
Meas. Control	
Repetition	Continuous
Stop Condition	None
Statistic Count	100
BS Signal Level	
CDMA Power	- 52.0 dBm
F-FCH Level	- 7.4 dB
F-PICH Level	- 7.0 dB
Impairments	
AWGN Level	Off
BS Freq. Offset	Off
Limits	
Absolute Min Power	- 50.0 dBm
Waveform Quality	0.944

Figure 4-20: Measurement menu Power – Minimum Output

The *Minimum Output* application includes the following softkeys/hotkeys.

BS Signal Level

CDMA Power

The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control

```
CONFigure:POWer:MIOutput:OQPSk:CONTrol:POWer:CDMA[?]
CONFigure:POWer:MIOutput:HPSK:CONTrol:POWer:CDMA[?]
<CDMA Power>
```

F-FCH Level

The *F-FCH Level* adjusts the Fundamental Channel level in the forward CDMA channel.

The *F-FCH Level* specifies the FULL frame rate traffic channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		RC 2		RC 3, 4		RC 5	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control

```
CONFigure:POWer:MIOutput:OQPSk:CONTrol:LEVel[?]
CONFigure:POWer:MIOutput:HPSK:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

F-PICH Level

The *F-PICH Level* hotkey adjusts the signal level of the Pilot Channel in the forward CDMA channel relative to the total output power.

Remote control

```
CONFigure:POWer:MIOutput:OQPSk:CONTrol:LEVel[?]
CONFigure:POWer:MIOutput:HPSK:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

Impairments

AWGN

The *AWGN* hotkey activates and adjusts the Additive White Gaussian Noise (AWGN) generator. Refer to page 4.34 for additional information.

Remote control

```
CONFigure:POWer:MIOutput:OQPSk:CONTrol:IMPairments[?]
CONFigure:POWer:MIOutput:HPSK:CONTrol:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

BS Freq. Offset

The *BS Freq. Offset* hotkey adjusts the carrier frequency of the Base Station.

Remote control

```
CONFigure:POWer:MIOutput:OQPSk:CONTrol:IMPairments[?]
CONFigure:POWer:MIOutput:HPSK:CONTrol:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

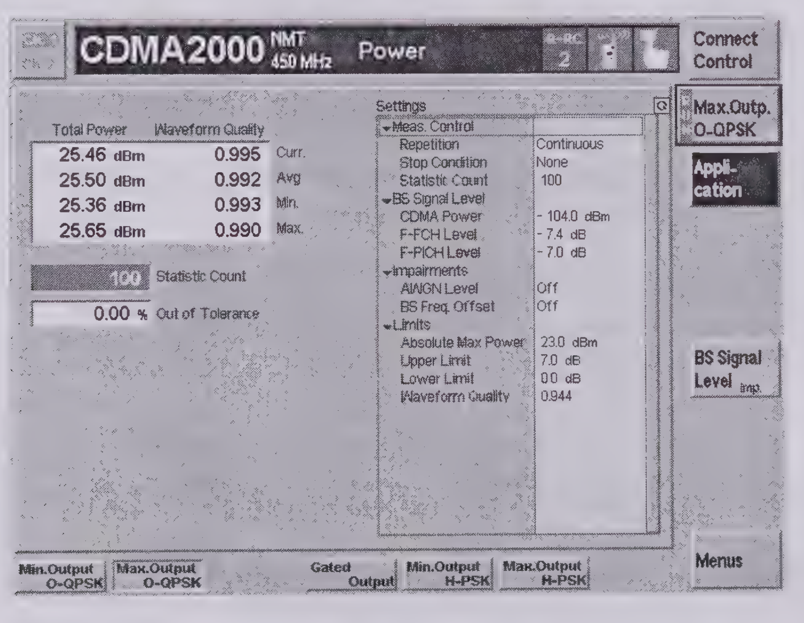
Maximum Output

The *Maximum Output* application is available for both O-QPSK and HPSK modulation schemes. The screen shots and discussions refer to O-QPSK but apply to both modulation schemes.

The *Maximum Output* application instructs the mobile station to increase its output power to its maximum level. The screen displays four measured values of the total channel power and the waveform quality of the signal. The application uses the values selected for CDMA Power, Traffic Level, and Pilot Level accessed either by the *BS Signal Level* softkey or in the *Control* tab of the *Power Configuration* menu.

The following values are returned for Total Power and Waveform Quality:

- Current is the current values of the measurement interval.
- Maximum and Minimum are the extreme values (and their polarity) of the power of all measurement intervals since the measurement started. Waveform quality measurements fo the minimum and maximum power measurements are made at the time of the extreme values.
- Average is the value of a number of measurement intervals averaged together (defined by the *Measurement Count* setting).
- Waveform Quality is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal O-QPSK/HPSK signal as defined in standard TIA/EIA IS-2000.



Total Power	Waveform Quality	
25.46 dBm	0.995	Curr.
25.50 dBm	0.992	Avg
25.36 dBm	0.993	Min.
25.65 dBm	0.990	Max.

100 Statistic Count

0.00 % Out of Tolerance

Settings

Meas. Control	
Repetition	Continuous
Stop Condition	None
Statistic Count	100
BS Signal Level	
CDMA Power	- 104.0 dBm
F-FCH Level	- 7.4 dB
F-PICH Level	- 7.0 dB
Impairments	
AWGN Level	Off
BS Freq. Offset	Off
Limits	
Absolute Max Power	23.0 dBm
Upper Limit	7.0 dB
Lower Limit	0.0 dB
Waveform Quality	0.944

Figure 4-21: Measurement menu Power – Maximum Output

BS Signal Level

CDMA Power The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control

```
CONFigure:POWer:MAOutput:OQPSk:CONTrol:POWer:CDMA[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol:POWer:CDMA[?]
<CDMA Power>
```

F-FCH Level The *F-FCH Level* sets the Fundamental Channel level in the forward CDMA channel.

The F-FCH Level specifies the FULL frame rate traffic channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		**RC 2**		**RC 3, 4**		**RC 5**	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control

```
CONFigure:POWer:MAOutput:OQPSk:CONTrol:LEVel[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

F-PICH Level The *F-PICH Level* hotkey adjusts the signal level of the Pilot Channel in the forward CDMA channel relative to the total output power.

Remote control

```
CONFigure:POWer:MAOutput:OQPSk:CONTrol:LEVel[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

Impairments

AWGN The *AWGN* hotkey activates and adjusts the Additive White Gaussian Noise (AWGN) generator. Refer to page 4.34 for additional information.

Remote control

```
CONFigure:POWer:MAOutput:OQPSk:CONTrol:IMPairments[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

BS Freq. Offset The *BS Freq. Offset* hotkey adjusts the carrier frequency of the Base Station.

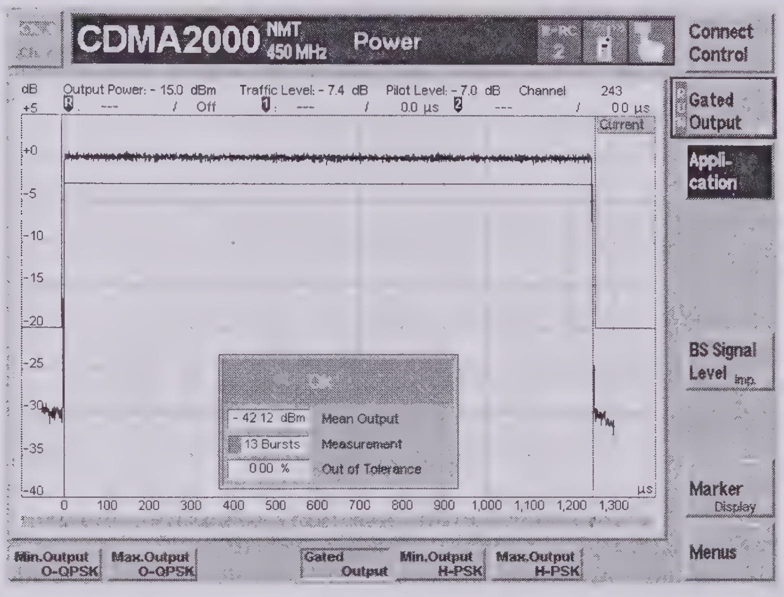
Remote control

```
CONFigure:POWer:MAOutput:OQPSk:CONTrol:IMPairments[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

Gated Output

The *Gated Output* application measures the time response of the mean output power for isolated gated-on power control groups.

> ***Note:*** *To ensure that the mobile station's output signal is gated, establish a connection with Reverse Radio Configuration 1 or 2.*


CDMA2000
NMT 450 MHz
Power
R-RC 2
Connect Control
Gated Output
Appli-cation
BS Signal Level
Marker Display
Menus
Min.Output O-QPSK
Max.Output O-QPSK
Gated Output
Min.Output H-PSK
Max.Output H-PSK
dB
+5
+0
-5
-10
-15
-20
-25
-30
-35
-40
Current
µs
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300

Output Power: - 15.0 dBm R: --- / Off
Traffic Level: - 7.4 dB 1: --- / 0.0 µs
Pilot Level: - 7.0 dB 2: --- / 0.0 µs
Channel 243

- 42.12 dBm Mean Output
13 Bursts Measurement
0.00 % Out of Tolerance

Figure 4-22: Measurement menu Power – Gated Output

BS Signal Level

CDMA Power The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control `CONFigure:POWer:GOutput:CONTrol:POWer:CDMA[?]` *`<CDMA Power>`*

F-FCH Level The *F-FCH Level* sets the Fundamental Channel level in the forward CDMA channel.

The *F-FCH Level* specifies the FULL frame rate traffic channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		RC 2		RC 3, 4		RC 5	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control `CONFigure:POWer:GOUTput:CONTrol:LEVel[?]` *`<FCH Level>, <Pilot Level>`*

F-PICH Level

The *F-PICH Level* hotkey adjusts the signal level of the Pilot Channel in the forward CDMA channel relative to the total output power.

Remote control
`CONFigure:POWer:GOUTput:CONTrol:LEVel[?]`
`<FCH Level>, <Pilot Level>`

Impairments

AWGN

The *AWGN* hotkey activates and adjusts the Additive White Gaussian Noise (AWGN) generator. Refer to page 4.34 for additional information.

Remote control
`CONFigure:POWer:GOUTput:CONTrol:IMPairments[?]`
`<AWGN Level>, <BS Freq Offset>`

BS Freq. Offset

The *BS Freq. Offset* hotkey adjusts the carrier frequency of the Base Station.

Remote control
`CONFigure:POWer:GOUTput:CONTrol:IMPairments[?]`
`<AWGN Level>, <BS Freq Offset>`

Marker

The *Marker* softkey positions up to three markers and a baseline (D-Line) in the test diagram and outputs their values. Refer to page 4.118 for detailed information about markers.

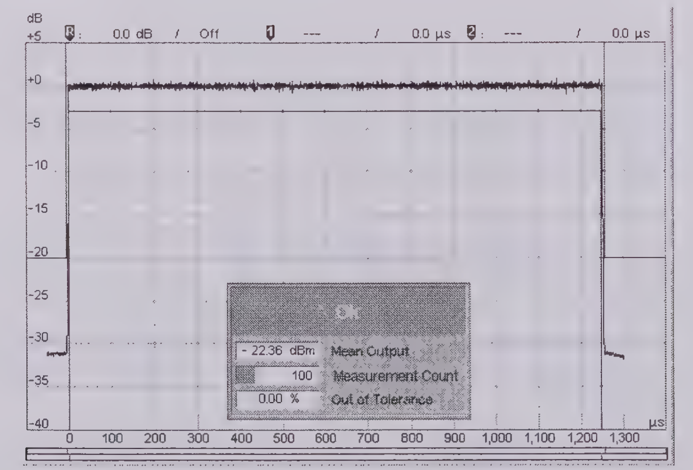
The measurement screen for Gated Output can be divided into two groups:

- Scalar measurement results (parameter lines)
- Graph (a trace plotted as a function of time)

Parameter line

Measurement graph

Info box



- 22.36 dBm Mean Output
100 Measurement Count
0.00 % Out of Tolerance

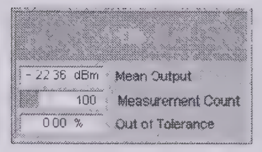
Figure 4-23: Display of measurement results (Gated Output screen)

Parameter line

The parameter line contains the position of each active marker. Off is displayed if the marker is not active.

R	Level and time of reference marker
1	Level and time of marker 1 (setting *absolute*) and/or difference from reference marker (setting *relative*)
2	Level and time of marker 2 (setting *absolute*) and/or difference from reference marker (setting *relative*)

Info Box



-22.36 dBm	Mean Output
100	Measurement Count
0.00 %	Out of Tolerance

The info box displays measurements concerning the gated output application. If any parameter exceeds the set limits, the info box turns red.

Remote control

```
READ[:SCALar]:POWer:GOUTput?
FETCh[:SCALar]:POWer:GOUTput?
SAMPle[:SCALar]:POWer:GOUTput?
```

Measurement Graph

The *Measurement graph* is displayed as a continuous curve together with the limit lines and all active markers.

The graph in each measurement shows the respective measured power as a function of time.

The measured power is evaluated with 64 chips (i.e. 52 µs) before and after the actual isolated Power Control Group (PCG). Considering an oversampling factor of 1, a total of 64 + 1536 + 64 = 1664 valid samples is returned.

Remote control

```
READ:ARRays:POWer:GOUTput:CURRent?
READ:ARRays:POWer:GOUTput:AVERage?
READ:ARRays:POWer:GOUTput:MINimum?
READ:ARRays:POWer:GOUTput:MAXimum?
FETCh:ARRays:POWer:GOUTput:CURRent?
FETCh:ARRays:POWer:GOUTput:AVERage?
FETCh:ARRays:POWer:GOUTput:MINimum?
FETCh:ARRays:POWer:GOUTput:MAXimum?
SAMPle:ARRays:POWer:GOUTput:CURRent?
SAMPle:ARRays:POWer:GOUTput:AVERage?
SAMPle:ARRays:POWer:GOUTput:MINimum?
SAMPle:ARRays:POWer:GOUTput:MAXimum?
```

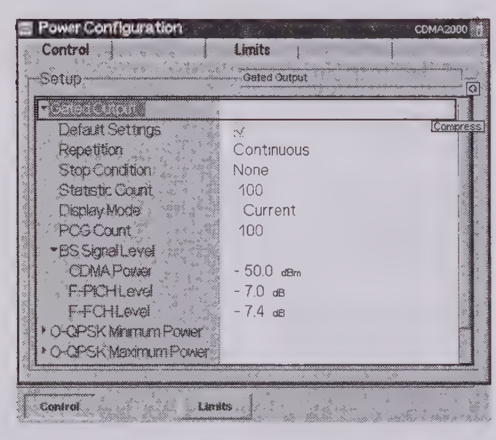
Power Configuration

The popup menu *Power Configuration* contains index cards that define the parameters of each power measurement.

Pressing the power measurement softkey twice (once if already selected) opens the popup menu *Power Configuration*. Use the hotkeys at the bottom of the screen to change between the index cards. Use the *EXP/CMP* front panel key to expand or compress the list of displayed settings.

Power Configuration – Control

The *Control* tab controls each of the power measurement applications. Each application lists the available settings for controlling the measurement.



Default Settings	✓
Repetition	Continuous
Stop Condition	None
Statistic Count	100
Display Mode	Current
PCG Count	100
BS Signal Level	
CDMA Power	- 50.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
O-QPSK Minimum Power	
O-QPSK Maximum Power	

Figure 4-24: Power Configuration – Control

Each available setting is described below. All settings may not be available for all power measurement applications.

Default Settings The *Default Settings* assigns default values to all parameters of the *Control* index card for the individual measurement.

Repetition *Repetition* determines the repetition mode as described below.

Single Shot: The measurement is stopped after a statistic cycle, i.e. after the number of waveform intervals/evaluation periods set in the configuration menu *Statistics*. The *Stop Condition* setting may stop the measurement before completion of a cycle. A stopped measurement is indicated by the status display *HLT* in the measurement softkey.

Single shot should be selected only if a single measurement result is required under fixed conditions.

Continuous The CMU continues the measurement until it is terminated explicitly or until the stop condition is met. The measurement results are valid after one statistic cycle; however, the measurement is continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the measurement softkey.

The continuous measurement is suitable for monitoring the evolution of a measured quantity in time, for example when performing adjustments.

> **Note:** *In remote mode, the counting measurement (counting mode) is available as a further measurement mode with a defined number of measurement cycles to be performed, refer to Chapter 6 of this manual.*
>
> *The Stop Condition setting can affect the Single Shot and Continuous repetition modes.*

Remote control

```
CONFigure:POWer:MIOutput[:OQPSk]:CONTrol:REPetition[?]
CONFigure:POWer:MIOutput:HPSK:CONTrol:REPetition[?]
CONFigure:POWer:MAOutput[:OQPSk]:CONTrol:REPetition[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol:REPetition[?]
CONFigure:POWer:GOUTput[:OQPSk]:CONTrol:REPetition[?]
CONFigure:POWer:GOUTput:HPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>
```

Stop Condition *Stop Condition* selects one of two stop conditions for the measurement:

NONE	The measurement continues even if tolerances are exceeded.
On Limit Failure	The measurement is stopped when a tolerance is exceeded.

> **Note:** *The Stop Condition setting can affect the Single Shot and Continuous repetition modes.*

Remote control See *Repetition* above.

Statistic Count *Statistic Count* defines the length of the statistic cycles in waveform intervals/evaluation periods.

1 to 1000	Number of intervals per statistic cycle.

Remote control

```
CONFigure:POWer:MIOutput[:OQPSk]:CONTrol:STATistics[?]
CONFigure:POWer:MIOutputHPSK::CONTrol:STATistics[?]
CONFigure:POWer:MAOutput[:OQPSk]:CONTrol:STATistics[?]
CONFigure:POWer:MAOutputHPSK::CONTrol:STATistics[?]
CONFigure:POWer:GOUTput[:OQPSk]:CONTrol:STATistics[?]
CONFigure:POWer:GOUTput:HPSK::CONTrol:STATistics[?]
<Statistics>
```

Display Mode *Display Mode* sets which measurement values are displayed as a graph.

PCG Count *PCG Count* defines how many power control groups are used for a single trace in the Gated Output measurement.

Remote control

```
CONFigure:POWer:GOUTput:CONTrol:PCGcount[?]
<PCG Count>
```

BS Signal Level *Levels* sets the power levels independently for each power application.

CDMA Power *CDMA Power* sets the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control

```
CONFigure:POWer:MIoutput:OQPSk:CONTrol:POWer:CDMA[?]
CONFigure:POWer:MIoutput:HPSK:CONTrol:POWer:CDMA[?]
CONFigure:POWer:MAoutput:OQPSk:CONTrol:POWer:CDMA[?]
CONFigure:POWer:MAoutput:HPSK:CONTrol:POWer:CDMA[?]
CONFigure:POWer:GOUTput:CONTrol:POWer:CDMA[?]
<CDMA Power>
```

F-FCH Level The *F-FCH Level* adjusts the signal level of the Fundamental Channel in the forward CDMA channel.

The *F-FCH Level* specifies the FULL frame rate fundamental channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		**RC 2**		**RC 3, 4**		**RC 5**	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control

```
CONFigure:POWer:MIoutput:OQPSk:CONTrol:LEVel[?]
CONFigure:POWer:MIoutput:HPSK:CONTrol:LEVel[?]
CONFigure:POWer:MAoutput:OQPSk:CONTrol:LEVel[?]
CONFigure:POWer:MAoutput:HPSK:CONTrol:LEVel[?]
CONFigure:POWer:GOUTput:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

F-PICH Level *F-PICH Level* adjusts the signal level of the Pilot Channel in the forward CDMA channel.

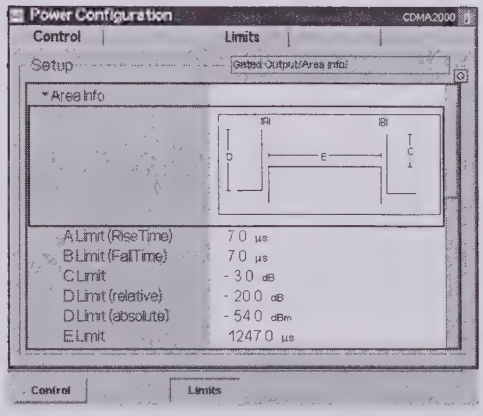
Remote control See *F-FCH Level* above.

Power Configuration – Limits

The *Limits* tab defines tolerance limits for each of the Power measurement applications. This limits discussion is divided into two groups, Gated Power Limits and Minimum/Maximum Limits.

Gated Output Power Limits

The limits for the *Gated Output* application consist of a graphical tool for defining and monitoring tolerance values.



Setup: Gated Output/Area info

A Limit (Rise Time)	7 0 µs
B Limit (Fall Time)	7 0 µs
C Limit	- 3 0 dB
D Limit (relative)	- 20 0 dB
D Limit (absolute)	- 54 0 dBm
E Limit	1247 0 µs

Figure 4-25: Power Configuration – Gated Output power limits

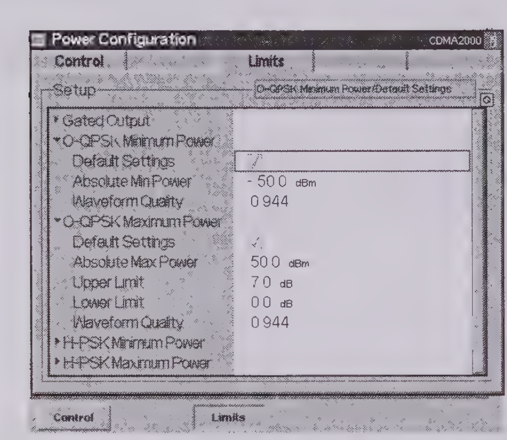
Default Settings *Default Settings* assigns default values to all parameters of the *Control* index card for the individual measurement.

Remote control `DEFault:POWer:GOUTput:LIMit[?]` `ON | OFF`

Area info (Limit Definitions)

A Limit (Rise Time)	Sets the maximum rise time.
B Limit (Fall Time)	Sets the maximum fall time.
C Limit	Sets the minimum level of the gated-on power relative to the mean output power.
D Limit (relative)	Sets the maximum level of the gated-off power relative to the mean output power.
D limit (absolute)	Sets the absolute maximum level of the gated-off power.
E Limit	Sets the minimum gated-on time.

Minimum/Maximum Power Limits



Gated Output
O-QPSK Minimum Power
Default Settings ✓
Absolute Min Power -50.0 dBm
Waveform Quality 0.944
O-QPSK Maximum Power
Default Settings ✓
Absolute Max Power 50.0 dBm
Upper Limit 7.0 dB
Lower Limit 0.0 dB
Waveform Quality 0.944
H-PSK Minimum Power
H-PSK Maximum Power

Figure 4-26: Power Configuration – Minimum/Maximum Power Limits

Minimum Power (O-QPSK and HPSK)

Default Settings	The *Default Settings* assigns default values to all parameters of the *Control* index card for the individual measurement.
Absolute Min Power	*Absolute Minimum Power* sets the minimum power level of the mean output power.
Waveform Quality	*Waveform Quality* sets the minimum value acceptable for the calculated waveform quality.

Remote control

```
CONFigure:POWer:MIOutput[:OQPSk]:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?]
CONFigure:POWer:MIOutput:HPSK:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?]
<Absolute Min Power>, <Waveform Quality>
```

Maximum Output (O-QPSK and HPSK)

Default Settings	The *Default Settings* assigns default values to all parameters of the *Control* index card for the individual measurement.
Absolute Max Power	*Absolute Maximum Power* sets the maximum power level of the mean output power.
Upper Limit	*Upper Limit* sets the maximum level of the mean output power relative to the MS nominal maximum output power.
Lower Limit	*Lower Limit* sets the minimum level of the mean output power relative to the MS nominal maximum output power.
Waveform Quality	*Waveform Quality* sets the minimum value acceptable for the calculated waveform quality.

Remote control

```
CONFigure:POWer:MAOutput[:OQPSk]:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?]
CONFigure:POWer:MAOutput:HPSK:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?]
<Absolute Max Power>, <Upper Limit>, <Lower Limit>, <Waveform Quality>
```

Modulation Measurements

The menu group Modulation *contains several applications to measure the modulation parameters such as frequency error, waveform quality of the mobile station, and matching of the respective tolerance limits. Measurement results are displayed with a graph and a table of measurement results. The popup menu* Modulation Configuration *configures the parameters of the modulation measurements.*

Note: *The CMU supports both O-QPSK and H-PSK modulation schemes. The CMU automatically selects the correct modulation scheme unless this feature is disabled in the Misc. tab of the Connection Control screen. Refer to User Guidance on page 4.117.*

The screen shots and discussions in this chapter refer to O-QPSK but apply to both modulation schemes.

The CMU measures the O-QPSK / HPSK modulation accuracy by calculating the Phase Error, Magnitude Error, and Error Vector Magnitude of the modulated signal from the mobile station. Figure 4-27 shows a representation of these signal errors compared to an ideal signal.

Phase Error (PE) is the measured phase difference of the I/Q components of the signal received (from the mobile station) and an ideal reference signal at the detection points.

Magnitude Error (ME) is the normalized magnitude (amplitude) difference of the I/Q components of the signal received from the mobile station and an ideal reference signal at the detection points.

Error Vector Magnitude (EVM) is the normalized magnitude of the calculated vector linking the measured I/Q values to the ideal signal's I/Q components at the detection points.

The In-phase and Quadrature reference components are based on an O-QPSK / HPSK waveform as specified in the IS-2000 standards publication.

For a CDMA2000 signal (HPSK in RC3, 4) the composite Phase Error (PE), Magnitude Error (ME), Error Vector Magnitude (EVM), and Waveform Quality are calculated.

The measurement interval for O-QPSK / HPSK is 616 chip intervals (≅0.5 ms). The graphical displays represents 500 chips for O-QPSK and 616 chips for HPSK..

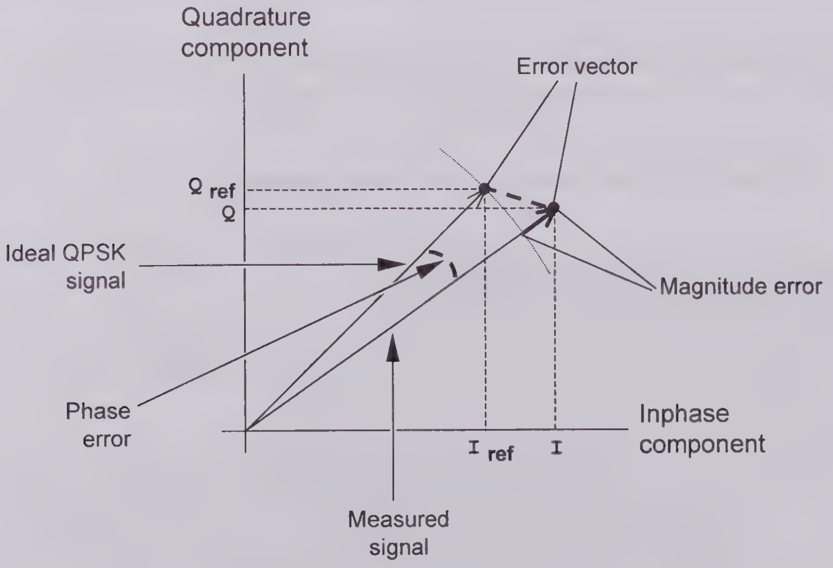
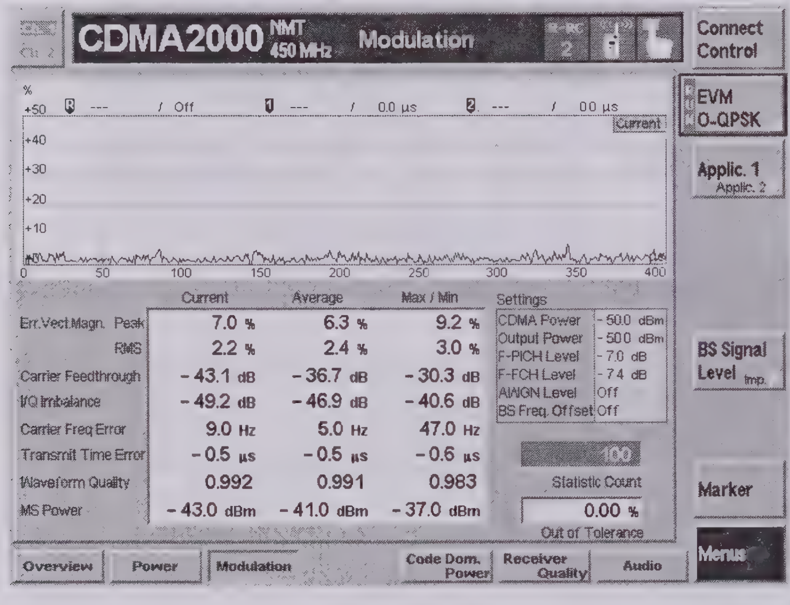


Figure 4-27: Modulation errors

The *Modulation* menu is typically opened using the hotkey *Modulation* (see Figure 4-28). The initial screen returns to the modulation application last accessed.

> **Note:** *This menu is also accessible from the main menu screen by pressing the Menu Select front panel key and selecting CDMA>Signalling>Modulation.*


CDMA2000
NMT 450 MHz
Modulation
Connect Control
EVM O-QPSK
Measurement softkey
Applic. 1
Applic. 2
BS Signal Level
Marker
Menus
%
+50
+40
+30
+20
+10
--- / Off
--- / 0.0 µs
--- / 0.0 µs
Current
0
50
100
150
200
250
300
350
400
Overview
Power
Modulation
Code Dom. Power
Receiver Quality
Audio

	Current	Average	Max / Min
Err.Vect.Magn. Peak	7.0 %	6.3 %	9.2 %
RMS	2.2 %	2.4 %	3.0 %
Carrier Feedthrough	- 43.1 dB	- 36.7 dB	- 30.3 dB
I/Q Imbalance	- 49.2 dB	- 46.9 dB	- 40.6 dB
Carrier Freq Error	9.0 Hz	5.0 Hz	47.0 Hz
Transmit Time Error	- 0.5 µs	- 0.5 µs	- 0.6 µs
Waveform Quality	0.992	0.991	0.983
MS Power	- 43.0 dBm	- 41.0 dBm	- 37.0 dBm

Settings	
CDMA Power	- 50.0 dBm
Output Power	- 50.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
AWGN Level	Off
BS Freq. Offset	Off

Statistic Count: 100

Out of Tolerance: 0.00 %

Figure 4-28: Modulation measurement menu

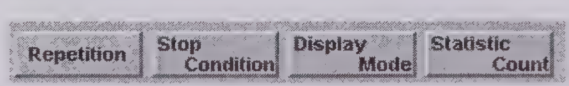
The measurement softkey indicates the current modulation measurement and its status *(RUN | HLT | OFF)*. This softkey also opens and closes the *Modulation Configuration* menu. The modulation configuration descriptions begin on page 4.65.

Softkey Selections

Each modulation measurement provides the same softkey and hotkey selections. (*Overview O-QPSK* doesn't contain a *Marker* softkey since there is no graphical display.) The descriptions of the common keys immediately follows.

Measurement softkey

The measurement softkey activates a set of hotkeys to select a modulation application.


Repetition
Stop Condition
Display Mode
Statistic Count

Repetition

The *Repetition* hotkey displays a popup window to select the repetition mode of the measurement between continuous and single shot.

Single Shot: The measurement is stopped after a statistic cycle, i.e. after the number of waveform intervals/evaluation periods set in the configuration menu *Statistics* . The *Stop Condition* setting may stop the measurement before completion of a cycle. A stopped measurement is indicated by the status display *HLT* in the measurement softkey.

Single shot should be selected if only a single measurement result is required under fixed conditions.

Continuous The CMU continues the measurement until it is terminated explicitly or until the stop condition is met. The measurement results are valid after one statistic cycle; however, the measurement is continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the measurement softkey.

The continuous measurement is suitable for monitoring the evolution of a measured quantity in time, for example when performing adjustments.

> ***Note:** In remote mode, the counting measurement (counting mode) is available as a further measurement mode with a defined number of measurement cycles to be performed, refer to chapter 6 of this manual.*
>
> *The Stop Condition setting can affect the Single Shot and Continuous repetition modes.*

Remote control

```
CONFigure:MODulation:OVERview[:OQPSk]:CONTrol:REPetition[?]
CONFigure:MODulation:OVERview:HPSK:CONTrol:REPetition[?]
CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol:REPetition[
?]
CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:REPetition[?]
CONFigure:MODulation:MERRor[:OQPSk]:CONTrol:REPetition[?]
CONFigure:MODulation:MERRor:HPSK:CONTrol:REPetition[?]
CONFigure:MODulation:PERRor[:OQPSk]:CONTrol:REPetition[?]
CONFigure:MODulation:PERRor:HPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>
```

Stop Condition

The *Stop Condition* hotkey selects one of two stop conditions for the measurement:

NONE:	Continue measurement even if set limits have been exceeded.
On Limit Failure:	Stop measurement if a set limit has been exceeded (tolerance exceeded).

The stop conditions may affect single-shot and continuous measurement settings.

Remote control See *Repetition* above.

Display Mode

The *Display Mode* hotkey sets which measurement values are displayed as a graph.

Current	Measured value for the current waveform interval
Max/Min	Extreme value over a number of waveform intervals.
Average	Average value over a number of waveform intervals

The number of cycles for the calculation of the statistic values *Minimum/Maximum* and *Average* depends on the repetition mode set in the *Control* tab.

Single shot:	Display of minimum, maximum and average value from the performed statistic cycle.
Continuous:	Display of minimum and maximum values from all waveform intervals already measured. The average value refers to the last statistic cycle using a sliding window effect.

Statistic Count

The *Statistic Count* hotkey defines the number of waveform intervals per statistic cycle.

1 to 1000	Number of measurement intervals per statistic cycle.

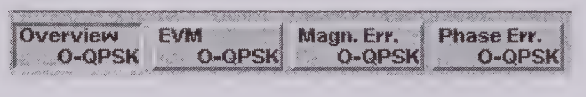
Remote control

```
CONFigure:MODulation:OVERview[:OQPSk]:CONTrol:STATistics[?]
CONFigure:MODulation:OVERview:HPSK:CONTrol:STATistics[?]
CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol:STATistics[
?]
CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:STATistics[?]
CONFigure:MODulation:MERRor[:OQPSk]:CONTrol:STATistics[?]
CONFigure:MODulation:MERRor:HPSK:CONTrol:STATistics[?]
CONFigure:MODulation:PERRor[:OQPSk]:CONTrol:STATistics[?]
CONFigure:MODulation:PERRor:HPSK:CONTrol:STATistics[?]
<Statistic Count>
```

Applic 1

The *Application* softkey activates a set of hotkeys to select a modulation application. This softkey toggles the application hotkeys between the O-QPSK and H-PSK modulation schemes. When an application is selected, the corresponding measurement screen is displayed.

Only O-QPSK keys and menus are shown and described but the information also applies to H-PSK.



Overview O-QPSK

The *Overview O-QPSK* hotkey displays the statistics for all modulation measurements. No graphical display is provided.

Remote control

```
INITiate:MODulation:OVERview[:OQPSk]
ABORt:MODulation:OVERview[:OQPSk]
STOP:MODulation:OVERview[:OQPSk]
CONTinue:MODulation:OVERview[:OQPSk]

INITiate:MODulation:OVERview:HPSK
ABORt:MODulation:OVERview:HPSK
STOP:MODulation:OVERview:HPSK
CONTinue:MODulation:OVERview:HPSK
```

EVM O-QPSK

The *Error Vector Magnitude* hotkey displays the Error Vector Magnitude. The Error Vector Magnitude measurement description begins on page 4.64.

Remote control

```
INITiate:MODulation:EVMagnitude[:OQPSk]
ABORt:MODulation:EVMagnitude[:OQPSk]
STOP:MODulation:EVMagnitude[:OQPSk]
CONTinue:MODulation:EVMagnitude[:OQPSk]
```

```
INITiate:MODulation:EVMagnitude:HPSK
ABORt:MODulation:EVMagnitude:HPSK
STOP:MODulation:EVMagnitude:HPSK
CONTinue:MODulation:EVMagnitude:HPSK
```

Magn Err. O-QPSK

The *Magnitude Error* hotkey displays the Magnitude Error measurement. The Magnitude Error measurement description begins on page 4.63.

Remote control

```
INITiate:MODulation:MERRor[:OQPSk]
ABORt:MODulation:MERRor[:OQPSk]
STOP:MODulation:MERRor[:OQPSk]
CONTinue:MODulation:MERRor[:OQPSk]

INITiate:MODulation:MERRor:HPSK
ABORt:MODulation:MERRor:HPSK
STOP:MODulation:MERRor:HPSK
CONTinue:MODulation:MERRor:HPSK
```

Phase Err. O-QPSK

The *Phase Error* hotkey displays the Phase Error measurement. The Phase Error measurement description begins on page 4.59.

Remote control

```
INITiate:MODulation:PERRor[:OQPSk]
ABORt:MODulation:PERRor[:OQPSk]
STOP:MODulation:PERRor[:OQPSk]
CONTinue:MODulation:PERRor[:OQPSk]

INITiate:MODulation:PERRor:HPSK
ABORt:MODulation:PERRor:HPSK
STOP:MODulation:PERRor:HPSK
CONTinue:MODulation:PERRor:HPSK
```

Impairm.

The *Impairments* softkey displays a set of hotkeys to adjust the AWGN and BS frequency offset.

AWGN

The *AWGN* hotkey activates and adjusts the Additive White Gaussian Noise (AWGN) generator. Refer to page 4.34 for additional information.

Remote control

```
CONFigure:MODulation:OEMP[:OQPSk]:IMPairments
CONFigure:MODulation:OEMP:HPSK:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

BS Freq. Offset

The *BS Freq. Offset* hotkey adjusts the carrier frequency of the Base Station.

Remote control

```
CONFigure:MODulation:OEMP[:OQPSk]:IMPairments
CONFigure:MODulation:OEMP:HPSK:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

BS Signal Level

The *BS Signal Level* softkey displays a set of hotkeys to adjust the CDMA power and channel levels.

CDMA Power

The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control

```
CONFigure:MODulation:OEMP[:OQPSk]:CONTrol:POWer:CDMA[?]
CONFigure:MODulation:OEMP:HPSK:CONTrol:POWer:CDMA[?]
```

control *<CDMA Power>*

F-FCH Level

The *F-FCH Level* hotkey adjusts the signal level of the Fundamental Channel in the forward CDMA channel.

The *F-FCH Level* specifies the FULL frame rate fundamental channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		RC 2		RC 3, 4		RC 5	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control

```
CONFigure:MODulation:OEMP[:OQPSk]:CONTrol:LEVel[?]
CONFigure:MODulation:OEMP:HPSK:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

F-PICH Level

The *F-PICH Level* hotkey adjusts the signal level of the Pilot Channel in the forward CDMA channel relative to the total output power.

Remote control

```
CONFigure:MODulation:OEMP[:OQPSk]:CONTrol:LEVel[?]
CONFigure:MODulation:OEMP:HPSK:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

Marker

The *Markers* softkey displays a set of hotkeys to activate the reference markers on the graphical display. A detailed description of the markers begins on page 4.118.

Menus

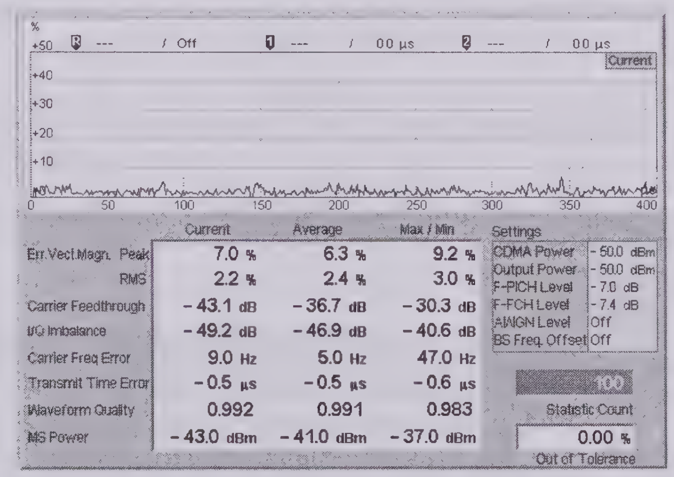
The *Menus* softkey displays the hotkeys bar for changing to other measurement menus (Overview, Power, and Receiver Quality).

Measurement Results

The modulation measurement screens are similar for each modulation application. (The Overview application does not provide a graph.) The description of the graphs and common output data immediately follows. Information specific to an application is located within the application heading. Limits for all modulation measurements are defined in the *Modulation Control* configuration menu.

The measurement screens can be divided into three groups:

- Scalar measurement results (parameter lines and output tables)
- Graph (a trace plotted as a function of time)
- Settings overview



R --- / Off 1 --- / 0.0 µs 2 --- / 0.0 µs

	Current	Average	Max / Min
Err.Vect.Magn. Peak	7.0 %	6.3 %	9.2 %
RMS	2.2 %	2.4 %	3.0 %
Carrier Feedthrough	- 43.1 dB	- 36.7 dB	- 30.3 dB
I/Q Imbalance	- 49.2 dB	- 46.9 dB	- 40.6 dB
Carrier Freq Error	9.0 Hz	5.0 Hz	47.0 Hz
Transmit Time Error	- 0.5 µs	- 0.5 µs	- 0.6 µs
Waveform Quality	0.992	0.991	0.983
MS Power	- 43.0 dBm	- 41.0 dBm	- 37.0 dBm

Settings	
CDMA Power	- 50.0 dBm
Output Power	- 50.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
AWGN Level	Off
BS Freq. Offset	Off

Statistic Count

0.00 %
Out of Tolerance

Parameter line

Measurement graph

Output table

Settings overview

Statistic count

Measurements out of tolerance

Figure 4-29: Modulation Results Display

Parameter Line The parameter line contains the position of each active marker. Off is displayed if the marker is not active.

R Measured error and time of the reference marker.

1 Measured error and time of marker 1 (setting *absolute*) or the difference from reference marker (setting *relative*).

2 Measured error and time of marker 2 (setting *absolute*) or the difference from reference marker (setting *relative*).

Measurement Graph The *Measurement Graph* is displayed as a continuous curve together with the limit lines and all active markers.

The graph in each measurement shows the respective measurement error as a function of time. The display mode for the graph *(Current, Average, Max/Min)* is indicated in the upper right corner of the screen.

Statistic Count The *Statistic Count* is the number of intervals since the start of the measurement. The bar graph represents a percentage of intervals measured based on the number of intervals set in the Statistics menu.

Output Table The output table contains a tabular overview of modulation related measurements. The first rows of data are specific to the selected modulation measurement. The remaining rows are identical for each modulation measurement.

Three values are given for each row:

Current	These are the current values of the measurement interval.
Max/Min	These are the extreme values (and their polarity) of all measurement intervals since the measurement started.
Average	These are the average values of a number of measurement intervals (defined by the *Measurement Count* setting).

Any values exceeding the defined limits appear with a red background. Limit values are set in the Modulation Configuration menus.

Modulation Error — Refer to the respective measurement type for information about the data reported in these first two rows.

Phase Error	Refer to page 4.62
Magnitude Error	Refer to page 4.63
Error Vector Magnitude	Refer to page 4.64

Carrier Feedthrough — *Carrier Feedthrough* refers to the origin offset, which is the magnitude of the RF carrier relative to the magnitude of the modulated carrier.

I/Q Imbalance — *I/Q Imbalance* is the amplitude ratio between the in-phase (I) and quadrature (Q) components of the signal.

Carrier Freq Error — *Carrier Frequency Error* is the difference between the nominal frequency of the selected channel and the measured frequency.

Transmit Time Error — *Transmission Time Error* is the time offset between the mobile station's signal and the CMU's signal.

Waveform Quality — *Waveform Quality* is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal O-QPSK signal as defined in standard TIA/EIA-98.

MS Power — *MS Power* is the total transmitted power level from the mobile station.

Remote control

```
READ[:SCALar]:MODulation:OVERview[:OQPSk]?
FETCh[:SCALar]:MODulation:OVERview[:OQPSk]?
SAMPle[:SCALar]:MODulation:OVERview[:OQPSk]?
READ[:SCALar]:MODulation:OVERview:HPSK?
FETCh[:SCALar]:MODulation:OVERview:HPSK?
SAMPle[:SCALar]:MODulation:OVERview:HPSK?

READ[:SCALar]:MODulation:EVMagnitude[:OQPSk]?
FETCh[:SCALar]:MODulation:EVMagnitude[:OQPSk]?
SAMPle[:SCALar]:MODulation:EVMagnitude[:OQPSk]?
READ[:SCALar]:MODulation:EVMagnitude:HPSK?
FETCh[:SCALar]:MODulation:EVMagnitude:HPSK?
SAMPle[:SCALar]:MODulation:EVMagnitude:HPSK?

READ[:SCALar]:MODulation:PERRor[:OQPSk]?
```

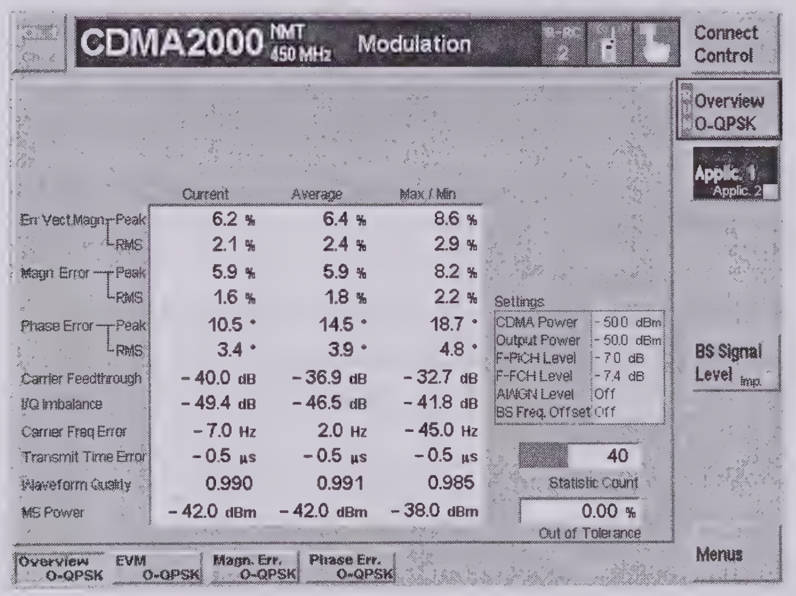
```
FETCh[:SCALar]:MODulation:PERRor[:OQPSk]?
SAMPle[:SCALar]:MODulation:PERRor[:OQPSk]?
READ[:SCALar]:MODulation:PERRor:HPSK?
FETCh[:SCALar]:MODulation:PERRor:HPSK?
SAMPle[:SCALar]:MODulation:PERRor:HPSK?

READ[:SCALar]:MODulation:MERRor[:OQPSk]?
FETCh[:SCALar]:MODulation:MERRor[:OQPSk]?
SAMPle[:SCALar]:MODulation:MERRor[:OQPSk]?
READ[:SCALar]:MODulation:MERRor:HPSK?
FETCh[:SCALar]:MODulation:MERRor:HPSK?
SAMPle[:SCALar]:MODulation:MERRor:HPSK?
```

Overview

The Overview application allows you to view all modulation measurements in a single output table (no graph of the measurements is provided).

The peak and the RMS values of the current measurement interval are displayed for each modulation application. The average values (positive or negative) are calculated over a user definable number of measurement counts. The Min/Max values are the extreme values from the start of the measurement.



		Current	Average	Max / Min
Err Vect.Magn.	Peak	6.2 %	6.4 %	8.6 %
	RMS	2.1 %	2.4 %	2.9 %
Magn Error	Peak	5.9 %	5.9 %	8.2 %
	RMS	1.6 %	1.8 %	2.2 %
Phase Error	Peak	10.5 °	14.5 °	18.7 °
	RMS	3.4 °	3.9 °	4.8 °
Carrier Feedthrough		- 40.0 dB	- 36.9 dB	- 32.7 dB
I/Q Imbalance		- 49.4 dB	- 46.5 dB	- 41.8 dB
Carrier Freq Error		- 7.0 Hz	2.0 Hz	- 45.0 Hz
Transmit Time Error		- 0.5 µs	- 0.5 µs	- 0.5 µs
Waveform Quality		0.990	0.991	0.985
MS Power		- 42.0 dBm	- 42.0 dBm	- 38.0 dBm

Settings

CDMA Power	- 50.0 dBm
Output Power	- 50.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
AWGN Level	Off
BS Freq. Offset	Off

Statistic Count: 40

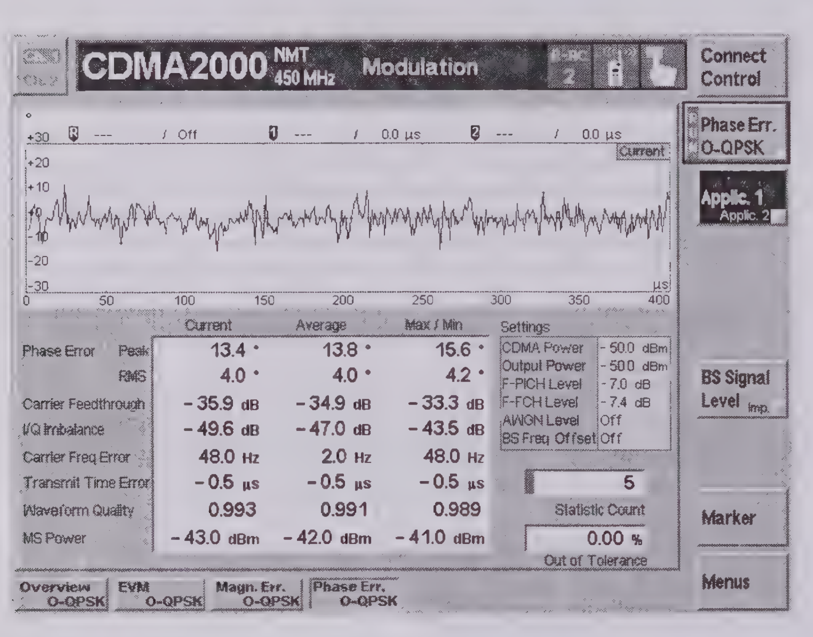
Out of Tolerance: 0.00 %

Figure 4-30: Overview O-QSPK display

Phase Error Measurement

Phase Error (PE) is the measured phase difference of the I/Q components of the signal received (from the mobile station) and an ideal reference signal at the detection points.

The graphical output represents the current interval of the measurement.


CDMA2000 NMT 450 MHz
Modulation
Connect Control
Phase Err. O-QPSK
Applic. 1
Applic. 2
BS Signal Level imp.
Marker
Menus
+30
+20
+10
0
-10
-20
-30
µs
0
50
100
150
200
250
300
350
400
/ Off
/ 0.0 µs
/ 0.0 µs
Current
Overview O-QPSK
EVM O-QPSK
Magn. Err. O-QPSK
Phase Err. O-QPSK

		Current	Average	Max / Min
Phase Error	Peak	13.4 °	13.8 °	15.6 °
	RMS	4.0 °	4.0 °	4.2 °
Carrier Feedthrough		- 35.9 dB	- 34.9 dB	- 33.3 dB
I/Q Imbalance		- 49.6 dB	- 47.0 dB	- 43.5 dB
Carrier Freq Error		48.0 Hz	2.0 Hz	48.0 Hz
Transmit Time Error		- 0.5 µs	- 0.5 µs	- 0.5 µs
Waveform Quality		0.993	0.991	0.989
MS Power		- 43.0 dBm	- 42.0 dBm	- 41.0 dBm

Settings	
CDMA Power	- 50.0 dBm
Output Power	- 50.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
AWGN Level	Off
BS Freq Offset	Off

Statistic Count: 5

Out of Tolerance: 0.00 %

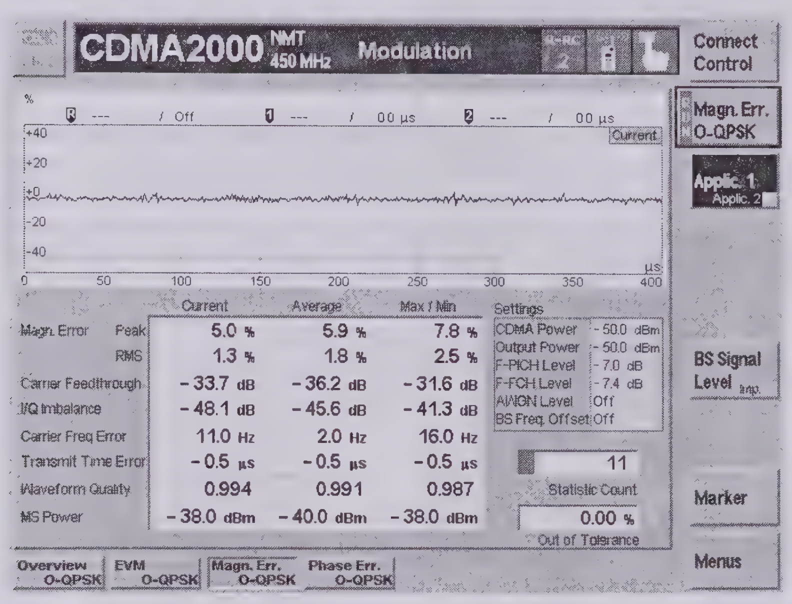
Figure 4-31: Phase Error display

Output Table	The first two rows of data are specific to the selected modulation measurement. The information in the remaining rows are identical for each modulation measurement.
Phase Error (Peak) (RMS)	The peak and the RMS phase error values of the current measurement interval are displayed. In addition, the average and extreme values are calculated.

Magnitude Error (ME) Measurement

Magnitude Error is the difference in magnitude (in percent) between the received signal waveform and an ideal O-QPSK signal waveform. The magnitude error is the difference in amplitude between the measured signal from the mobile station transmitter and an ideal signal waveform at the detection points.

The graphical output represents the current interval of the measurement.


CDMA2000
NMT
450 MHz
Modulation
2
Connect Control
%
R --- / Off
1 --- / 0.0 µs
2 --- / 0.0 µs
+40
+20
+0
-20
-40
Current
0
50
100
150
200
250
300
350
400
µs
Magn. Err. O-QPSK
Applic. 1
Applic. 2
BS Signal Level
Marker
Menus
Overview O-QPSK
EVM O-QPSK
Magn. Err. O-QPSK
Phase Err. O-QPSK

		Current	Average	Max / Min
Magn. Error	Peak	5.0 %	5.9 %	7.8 %
	RMS	1.3 %	1.8 %	2.5 %
Carrier Feedthrough		- 33.7 dB	- 36.2 dB	- 31.6 dB
I/Q Imbalance		- 48.1 dB	- 45.6 dB	- 41.3 dB
Carrier Freq Error		11.0 Hz	2.0 Hz	16.0 Hz
Transmit Time Error		- 0.5 µs	- 0.5 µs	- 0.5 µs
Waveform Quality		0.994	0.991	0.987
MS Power		- 38.0 dBm	- 40.0 dBm	- 38.0 dBm

Settings

CDMA Power	- 50.0 dBm
Output Power	- 50.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
AWGN Level	Off
BS Freq. Offset	Off

Statistic Count: 11

Out of Tolerance: 0.00 %

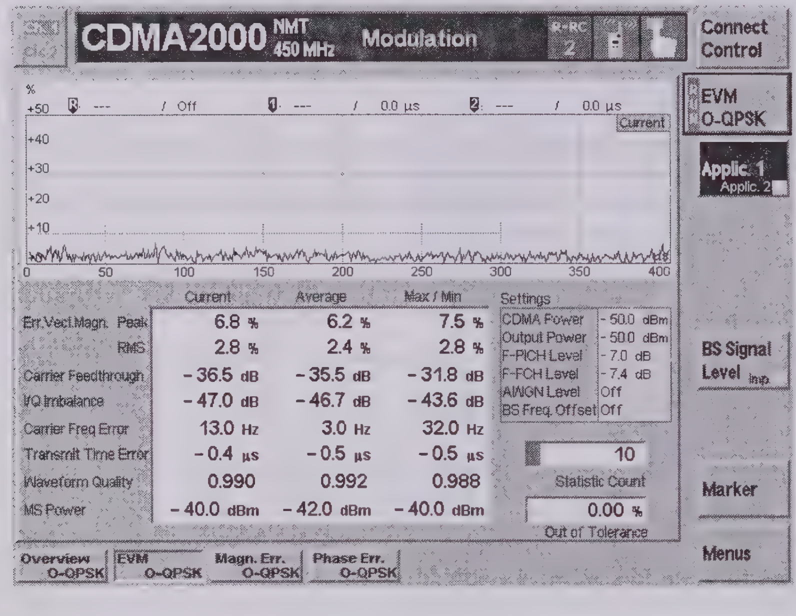
Figure 4-32: Magnitude Error display

Output Table	The first two rows of data are specific to the selected modulation measurement. The information in the remaining rows are identical for each modulation measurement.
Magnitude Error (Peak) (RMS)	The peak and the RMS magnitude error values of the current waveform interval are displayed. In addition, the average and extreme values are calculated.

Error Vector Magnitude (EVM) Measurement

Error Vector Magnitude is a calculated percentage of vector error (at the detection points) between the received signal and an ideal signal. The Error Vector Magnitude application plots a graph of the vector error as percentage versus. time.

The graphical output represents the current interval of the measurement.


CDMA2000 NMT 450 MHz
Modulation
R-RC 2
Connect Control
EVM O-QPSK
Applic. 1
Applic. 2
%
+50
+40
+30
+20
+10
/ Off
--- / 0.0 µs
--- / 0.0 µs
Current
0
50
100
150
200
250
300
350
400
BS Signal Level
Marker
Menus
Overview O-QPSK
EVM O-QPSK
Magn. Err. O-QPSK
Phase Err. O-QPSK

	Current	Average	Max / Min
Err.Vect.Magn. Peak	6.8 %	6.2 %	7.5 %
RMS	2.8 %	2.4 %	2.8 %
Carrier Feedthrough	- 36.5 dB	- 35.5 dB	- 31.8 dB
I/Q Imbalance	- 47.0 dB	- 46.7 dB	- 43.6 dB
Carrier Freq Error	13.0 Hz	3.0 Hz	32.0 Hz
Transmit Time Error	- 0.4 µs	- 0.5 µs	- 0.5 µs
Waveform Quality	0.990	0.992	0.988
MS Power	- 40.0 dBm	- 42.0 dBm	- 40.0 dBm

Settings

CDMA Power	- 50.0 dBm
Output Power	- 50.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
AWGN Level	Off
BS Freq. Offset	Off

Statistic Count: 10

Out of Tolerance: 0.00 %

Figure 4-33: Error Vector Magnitude display

Output Table	The first two rows of data are specific to the selected modulation measurement. The information in the remaining rows are identical for each modulation measurement.
Error Vector Magnitude (Peak) (RMS)	The peak and the RMS error vector magnitudes of the current waveform interval are displayed. In addition, the average and extreme deviations are calculated.

Modulation Configuration

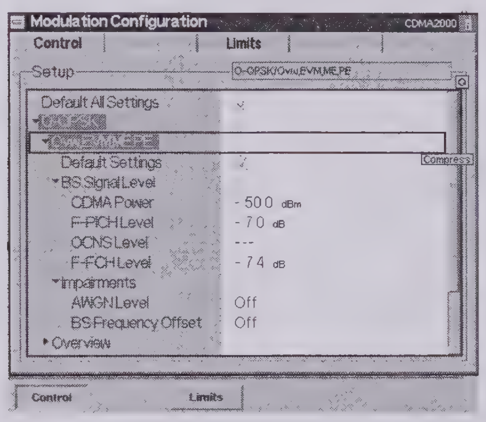
The popup menu *Modulation Configuration* contains three tabs that define the parameters of the modulation measurements including the error tolerances.

Pressing the measurement softkey twice opens the popup menu *Modulation Configuration*. Press the associated hotkeys to change between tabs. Use the EXP/CMP key to expand or compress the list of settings displayed.

Modulation Configuration – Control

The *Control* tab controls the modulation measurement applications. The control configuration is first divided into settings for O-QPSK and H-PSK. Within these categories, there are both configurations that affect all modulation measurements and settings for each individual modulation measurement.

Since the settings for O-QPSK and H-PSK are identical, only the O-QPSK menus are shown and described.



Setup: O-QPSK/Ovw,EVM,ME,PE

Default All Settings	✓
Default Settings	✓
▾ BS Signal Level	
CDMA Power	-50 0 dBm
F-PICH Level	-7 0 dB
OCNS Level	---
F-FCH Level	-7 4 dB
▾ Impairments	
AWGN Level	Off
BS Frequency Offset	Off
▸ Overview	

Figure 4-34: Modulation Control Configuration (Common Settings)

Default All Settings *Default All Settings* assigns default values to all parameters of the *Control* tab.

Default Settings *Default Settings* (located below each application heading) assigns default values to the parameters of the specific application.

BS Signal Level

CDMA Power *CDMA Power* sets the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control

```
CONFigure:MODulation:OEMP[:OQPSk]:CONtrol:POWer:CDMA[?]
CONFigure:MODulation:OEMP:HPSK:CONtrol:POWer:CDMA[?]
<CDMA Power>
```

F-PICH Level

F-PICH Level adjusts the signal level of the Pilot Channel in the forward CDMA channel relative to the total output power.

Remote control

```
CONFigure:MODulation:OEMP[:OQPSk]:CONTrol:LEVel[?]
CONFigure:MODulation:OEMP:HPSK:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

OCNS

OCNS displays the level of the Orthogonal Channel Noise Simulator. The OCNS automatically adds power along with the sum of the data, traffic, paging, sync, and pilot levels so that their sum equals the nominal base station power.

Remote control

```
SOURce:RFGenerator:LEVel:OCNS:VALue?

SOURce:RFGenerator:LEVel:OCNS:ENABle[?]
ON | OFF
```

F-FCH Level

The *F-FCH Level* adjusts the signal level of the Fundamental Channel in the forward CDMA channel.

The *F-FCH Level* specifies the FULL frame rate fundamental channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		**RC 2**		**RC 3, 4**		**RC 5**	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control

```
CONFigure:MODulation:OEMP[:OQPSk]:CONTrol:LEVel[?]
CONFigure:MODulation:OEMP:HPSK:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

Impairments

AWGN Level

AWGN Level turns on the Additive White Gaussian Noise generator. Refer to page 4.34 for additional information.

Remote control

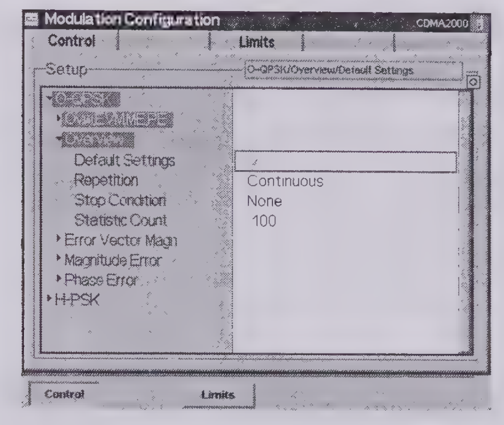
```
CONFigure:MODulation:OEMP[:OQPSk]:IMPairments[?]
CONFigure:MODulation:OEMP:HPSK:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

BS Frequency Offset

BS Frequency Offset adjusts the carrier frequency of the Base Station.

Remote control

```
CONFigure:MODulation:OEMP[:OQPSk]:IMPairments[?]
CONFigure:MODulation:OEMP:HPSK:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```



Repetition: Continuous
Stop Condition: None
Statistic Count: 100

Figure 4-35: Modulation Control Configuration (Application Settings)

Default Settings *Default Settings* (located below each application heading) assigns default values to the parameters of the specific application.

Repetition *Repetition* determines the repetition mode.

Single Shot The measurement is stopped after a statistic cycle, i.e. after the number of waveform intervals/evaluation periods set in the configuration menu *Statistics*. The *Stop Condition* setting may stop the measurement before completion of a cycle. A stopped measurement is indicated by the status display *HLT* in the measurement softkey.

Single shot should be selected if only a single measurement result is required under fixed conditions.

Continuous The CMU continues the measurement until it is terminated explicitly or until the stop condition is met. The measurement results are valid after one statistic cycle; however, the measurement is continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the measurement softkey.

The continuous measurement is suitable for monitoring the evolution of a measured quantity in time, for example when performing adjustments.

> ***Note:** In remote mode, the counting measurement (counting mode) is available as a further measurement mode with a defined number of measurement cycles to be performed, refer to chapter 6 of this manual.*
>
> *The Stop Condition setting can affect the Single Shot and Continuous repetition modes.*

Remote control

```
CONFigure:MODulation:OVERview[:OQPSk]:CONTrol:REPetition[?]
CONFigure:MODulation:OVERview:HPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>
```

Stop Condition *Stop Condition* selects one of two stop conditions for the measurement:

NONE	The measurement continues even if tolerances are exceeded
On Limit Failure	The measurement is stopped when a tolerance is exceeded

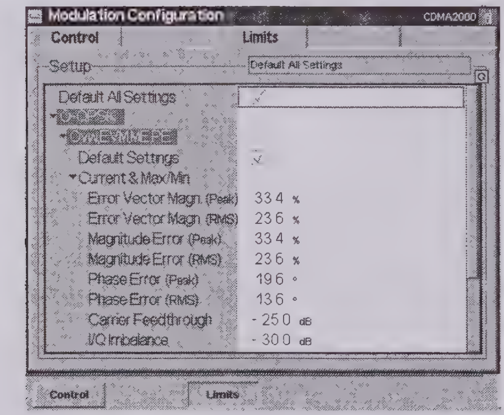
> **Note:** *The stop condition may affect the single-shot and continuous measurement repetition modes.*

Remote control

```
CONFigure:MODulation:OVERview[:OQPSk]:CONTrol:REPetition[?]
CONFigure:MODulation:OVERview:HPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>
```

Modulation Configuration – Limits

The *Limits* tab allows you to set the limits for the modulation measurements. Two sets of limits are configurable for each measurement: the Current and Maximum/Minimum measurement limits and the Average measurement limits.



Default All Settings ✓
[illegible]
[illegible]
Default Settings ✓
Current & Max/Min
Error Vector Magn. (Peak) 33.4 %
Error Vector Magn. (RMS) 23.6 %
Magnitude Error (Peak) 33.4 %
Magnitude Error (RMS) 23.6 %
Phase Error (Peak) 19.6 °
Phase Error (RMS) 13.6 °
Carrier Feedthrough -25.0 dB
I/Q Imbalance -30.0 dB

Figure 4-36: Modulation Limits Configuration Display

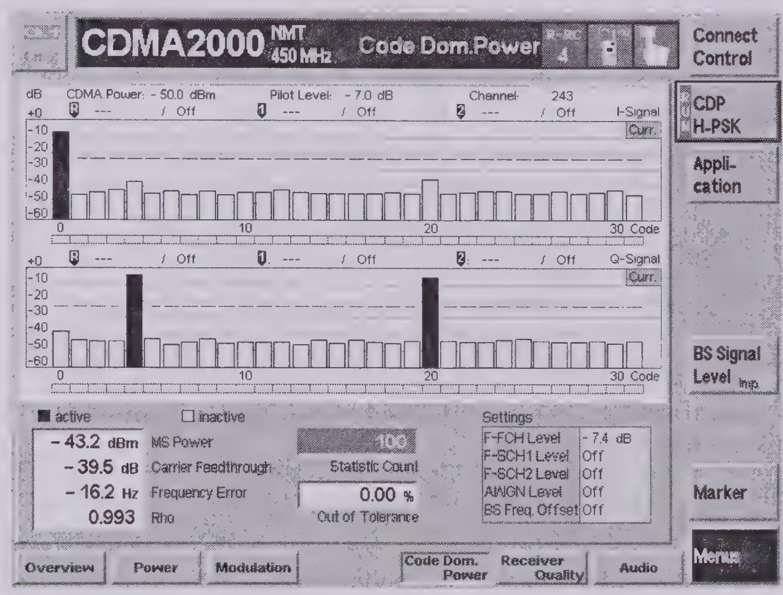
Default All Settings	The *Default All Settings* switch assigns default values to all parameters of the modulation *Limits* tab.
Default Settings	*Default Settings* assigns default values to all parameters of the *Limits* tab for all modulation measurements reported in the Overview O-QPSK display.
Current & Max/Min	*Current and Max/Min* sets the limits for the measured values in the current waveform interval or of the extreme values of all measured waveform intervals (Min/Max).
Average	*Average* sets the limits are for the average value of the measured values derived from the last statistic cycle.

Code Domain Power Measurements

The menu group *Code Domain Power* (CDP HPSK) contains the functions to measure the Code Domain Power (CDP), Peak Code Domain Error Power (PCDEP), and Channel Power.

The *Code Domain Power* menu is typically opened using the hotkey *Code Dom. Power* (see Figure 4-37). The initial screen returns to the power application last accessed.

> ***Note:*** *This menu is also accessible from the main menu screen by pressing the* Menu Select *front panel key and selecting CDMA>Signalling>Code Domain Power.*


CDMA2000 NMT 450 MHz
Code Dom.Power
Connect Control
CDP H-PSK
Appli-cation
BS Signal Level
Marker
Menus
dB
+0
-10
-20
-30
-40
-50
-60
0
10
20
30 Code
I-Signal
Q-Signal
Curr.
Off
active
inactive
Overview
Power
Modulation
Code Dom. Power
Receiver Quality
Audio

CDMA Power: - 50.0 dBm   Pilot Level: - 7.0 dB   Channel 243

- 43.2 dBm MS Power
- 39.5 dB Carrier Feedthrough
- 16.2 Hz Frequency Error
0.993 Rho

100 Statistic Count
0.00 % Out of Tolerance

Settings

F-FCH Level	- 7.4 dB
F-SCH1 Level	Off
F-SCH2 Level	Off
AWGN Level	Off
BS Freq. Offset	Off

Measurement softkey

CD Power hotkey

Figure 4-37: Code Domain Power

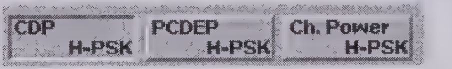
The measurement softkey indicates the current power application and its status (*RUN* | *HLT* | *OFF*). This softkey also opens and closes the *Code Domain Power Configuration* menu. The power measurements configuration description begins on page 4.83.

Softkey Selections

Each measurement provides similar softkey and hotkey menu selections. The softkeys and hotkeys common to all power applications are described here. Softkeys specific to an application are described within the application topic.

Appli-cation

The *Application* softkey activates a set of hotkeys to select a code domain power measurement. When an application is selected, the corresponding measurement screen is displayed.


CDP H-PSK
PCDEP H-PSK
Ch. Power H-PSK

CDP H-PSK

The *CDP H-PSK* hotkey changes the power measurement application to measure the Code Domain Power of the mobile station.

Remote control

```
INITiate:CDPOWer:CDPW
ABORt:CDPOWer:CDPW
STOP:CDPOWer:CDPW
CONTinue:CDPOWer:CDPW
```

PCDEP H-PSK

The *PCDEP H-PSK* hotkey changes the power measurement application to measure the Peak Code Domain Error Power of the mobile station.

Remote control

```
INITiate:CDPOWer:PCDEP
ABORt:CDPOWer:PCDEP
STOP:CDPOWer:PCDEP
CONTinue:CDPOWer:PCDEP
```

Ch.Power H-PSK

The *Ch. Power H-PSK* hotkey changes the power measurement application to measure the Channel Power of the mobile station.

Remote control

```
INITiate:CDPOWer:CHPW
ABORt:CDPOWer:CHPW
STOP:CDPOWer:CHPW
CONTinue:CDPOWer:CHPW
```

Impairm

The *Impairm. / BS Sig Lvl.* softkey toggles between two sets of hotkeys to adjust the signal impairments and the base station signal levels. Refer to the specific application for details about each hotkey.

Marker

The *Marker* softkey positions up to three markers and a baseline (D-Line) in the test diagram and outputs their values. Refer to page 4.118 for detailed information about markers.

Menus

The *Menus* softkey displays the hotkey bar for switching to the other measurement menus.

Measurement Results

The CMU measures the code power of the mobile station's physical channels, resulting in the Code Domain Power measurement. Three applications are available for Code Domain Power measurements.

Code Domain Power (CDP) is the power of the individual Walsh code channels of the mobile station. The screen displays a bar graph of the power level of the individual channels. Both I and Q signal power is displayed. The evaluation is done in code class 32.

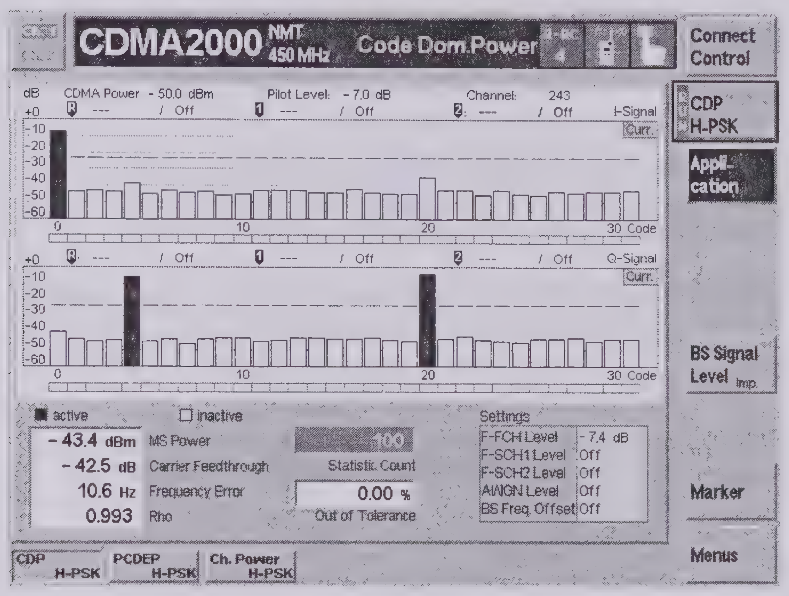
Peak Code Domain Error Power (PCDEP) is the measured I/Q signal compared to an ideal reference signal.

Channel Power (Ch. Power H-PSK) is the power of the reverse physical channels of both the I and Q signal.

Measurement results are explained for each application.

Code Domain Power

Code Domain Power measures the individual power level of each code channel and presents the results as bar graphs. Both the I-Signal and Q-Signal power levels are displayed.


CDMA2000
NMT 450 MHz
Code Dom.Power
Connect Control
CDP H-PSK
Appli-cation
BS Signal Level
Marker
Menus
I-Signal
Q-Signal
Curr.
dB
+0
-10
-20
-30
-40
-50
-60
0
10
20
30 Code
active
inactive
Settings
CDP H-PSK
PCDEP H-PSK
Ch. Power H-PSK

CDMA Power - 50.0 dBm
Pilot Level: - 7.0 dB
Channel: 243

- 43.4 dBm MS Power
- 42.5 dB Carrier Feedthrough
10.6 Hz Frequency Error
0.993 Rho

100 Statistic Count
0.00 % Out of Tolerance

F-FCH Level - 7.4 dB
F-SCH1 Level Off
F-SCH2 Level Off
AWGN Level Off
BS Freq. Offset Off

Figure 4-38: Measurement menu CD Power – Code Domain Power

The *Code Domain Power* application includes the following softkeys/hotkeys.

BS Signal Level

CDMA Power The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level. This is a common setting used for each of the Code Domain Power applications.

Remote control

```
CONFigure:CDPower:CPCCommon:CONTrol:POWer:CDMA[?]
<CDMA Power>
```

F-FCH Level The *F-FCH Level* adjusts the Fundamental Channel level in the forward CDMA channel. This is a common setting used for each of the Code Domain Power applications.

The *F-FCH Level* specifies the FULL frame rate traffic channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		RC 2		RC 3, 4		RC 5	
	bps	dB	bps	dB	bps	dB	bps	dB
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control

```
CONFigure:CDPower:CPCCommon:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

F-PICH Level

The *F-PICH Level* hotkey adjusts the signal level of the Pilot Channel in the forward CDMA channel relative to the total output power. This is a common setting used for each of the Code Domain Power applications.

Remote control
```
CONFigure:CDPower:CPCCommon:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

Impairm.

AWGN Level

The *AWGN* hotkey activates and adjusts the Additive White Gaussian Noise (AWGN) generator. Refer to page 4.34 for additional information. This is a common setting used for each of the Code Domain Power applications.

Remote control
```
CONFigure:CDPower:CPCCommon:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

Remote control
```
CONFigure:MODulation:OEMP:IMPairments <AWGN_Lev>
```

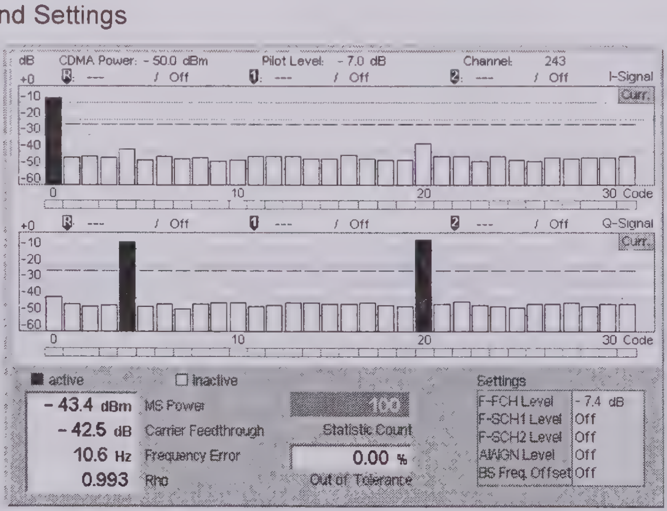
BS Freq. Offset

The *BS Freq. Offset* hotkey adjusts the carrier frequency of the Base Station. This is a common setting used for each of the Code Domain Power applications.

Remote control
```
CONFigure:CDPower:CPCCommon:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

The measurement screen for Code Domain Power can be divided into three groups:

- Scalar measurement results (parameter lines)
- Bar Graph
- Measurements and Settings



CDMA Power: - 50.0 dBm Pilot Level: - 7.0 dB Channel: 243

■ active ☐ inactive

- 43.4 dBm	MS Power
- 42.5 dB	Carrier Feedthrough
10.6 Hz	Frequency Error
0.993	Rho

100 Statistic Count

0.00 % Out of Tolerance

Settings

F-FCH Level	- 7.4 dB
F-SCH1 Level	Off
F-SCH2 Level	Off
AWGN Level	Off
BS Freq. Offset	Off

Figure 4-39: Display of measurement results (Code Domain Power screen)

Parameter line

The parameter line contains the position of each active marker. Off is displayed if the marker is not active.

R	Level and time of reference marker
1	Level and time of marker 1 (setting *absolute*) and/or difference from reference marker (setting *relative*)
2	Level and time of marker 2 (setting *absolute*) and/or difference from reference marker (setting *relative*)

Remote control

```
READ[:SCALar]:CDPower:CDPW?
FETCh[:SCALar]:CDPower:CDPW?
SAMPle[:SCALar]:CDPower:CDPW?
```

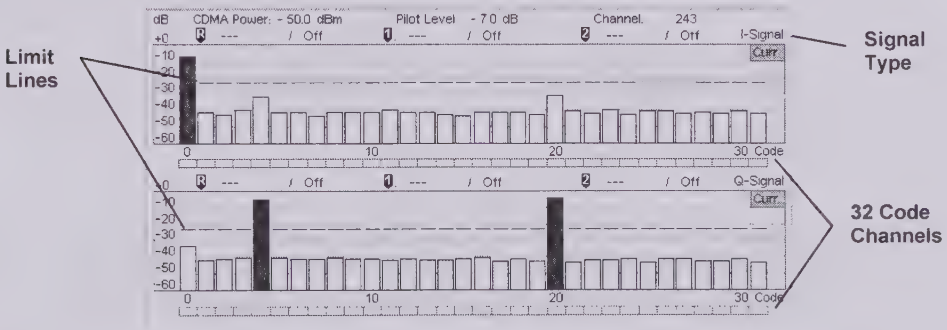
Measurement Bar Graphs

The *Measurement bar graph* is displays the power of each channel together with the limit lines and all active markers.

The bar graph either shows the current, average, or maximum levels as set in the configuration menu.

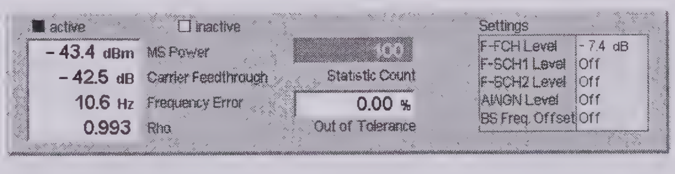
The limit lines provide a quick reference point to view channels exceeding set limits. The limit line level is set in the Configuration Menu.

The active channels are indicated with a solid bar graph while the inactive are outlined.



Measurements and Settings

This area displays the results of power and waveform quality measurements. Measurements in red indicate they exceed the limit set in the Configuration Menu.



■ active ☐ inactive

- 43.4 dBm	MS Power	100	Statistic Count
- 42.5 dB	Carrier Feedthrough		
10.6 Hz	Frequency Error	0.00 %	Out of Tolerance
0.993	Rho		

Settings

F-FCH Level	- 7.4 dB
F-SCH1 Level	Off
F-SCH2 Level	Off
AWGN Level	Off
BS Freq. Offset	Off

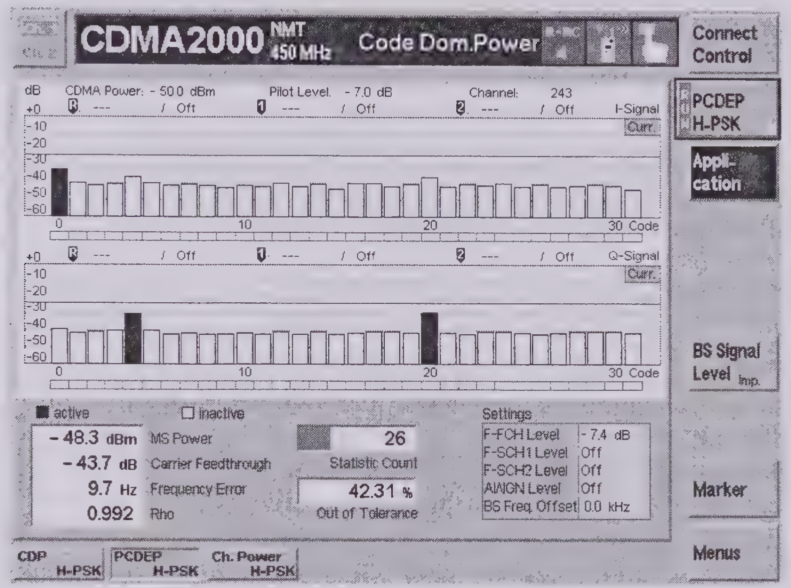
MS Power	*MS Power* is the total transmitted power level from the mobile station.
Carrier Feedthrough	*Carrier Feedthrough* refers to the origin offset, which is the magnitude of the RF carrier relative to the magnitude of the modulated carrier.
Frequency Error	*Frequency Error* is the difference between the nominal frequency of the selected channel and the measured frequency.
Rho	Rho is the ratio of the correlated power to the total power.

The correlated power is a calculated vector between a corrected signal and an ideal reference. The corrected signal is created by removing phase, frequency, and timing offsets.

Statistic Count	*Statistic Count* defines the length of the statistic cycles in waveform intervals/evaluation periods. *1 to 1000* Number of intervals per statistic cycle.
Out of Tolerance	*Out of Tolerance* is the percentage of waveform intervals that exceed the defined limits.
Settings	The Settings window lists the most important settings made in either the Configuration Menu or the hotkeys.

Peak Code Domain Error Power

Peak Code Domain Error Power (PCDEP) displays the error signal over the code domain channels. The error is the difference between the measured signal and the ideal reference signal.



CDMA2000 NMT 450 MHz
Code Dom.Power
Connect Control
PCDEP H-PSK
Application
BS Signal Level Imp.
Marker
Menus
I-Signal
Q-Signal
Curr.
dB
Code
active
inactive
CDP H-PSK
PCDEP H-PSK
Ch. Power H-PSK

CDMA Power: - 50.0 dBm
Pilot Level: - 7.0 dB
Channel: 243

- 48.3 dBm MS Power
- 43.7 dB Carrier Feedthrough
9.7 Hz Frequency Error
0.992 Rho

26 Statistic Count
42.31 % Out of Tolerance

Settings

F-FCH Level	- 7.4 dB
F-SCH1 Level	Off
F-SCH2 Level	Off
AWGN Level	Off
BS Freq. Offset	0.0 kHz

Figure 4-40: Measurement menu Peak Code Domain Error Power

The *Peak Code Domain Error Power* application includes the following softkeys/hotkeys.

BS Signal Level

CDMA Power The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level. This is a common setting used for each of the Code Domain Power applications.

Remote control `CONFigure:CDPower:CPCCommon:CONTrol:POWer:CDMA[?]` `<CDMA Power>`

F-FCH Level The *F-FCH Level* adjusts the Fundamental Channel level in the forward CDMA channel. This is a common setting used for each of the Code Domain Power applications.

The *F-FCH Level* specifies the FULL frame rate traffic channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		RC 2		RC 3, 4		RC 5	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control `CONFigure:CDPower:CPCCommon:CONTrol:LEVel[?]` `<FCH Level>, <Pilot Level>`

F-PICH Level

The *F-PICH Level* hotkey adjusts the signal level of the Pilot Channel in the forward CDMA channel relative to the total output power. This is a common setting used for each of the Code Domain Power applications.

Remote control `CONFigure:CDPower:CPCCommon:CONTrol:LEVel[?]` `<FCH Level>, <Pilot Level>`

Impairments

AWGN

The *AWGN* hotkey activates and adjusts the Additive White Gaussian Noise (AWGN) generator. Refer to page 4.34 for additional information. This is a common setting used for each of the Code Domain Power applications.

Remote control `CONFigure:CDPower:CPCCommon:IMPairments[?]` `<AWGN Level>, <BS Freq Offset>`

BS Freq. Offset

The *BS Freq. Offset* hotkey adjusts the carrier frequency of the Base Station. This is a common setting used for each of the Code Domain Power applications.

Remote control `CONFigure:CDPower:CPCCommon:IMPairments[?]` `<AWGN Level>, <BS Freq Offset>`

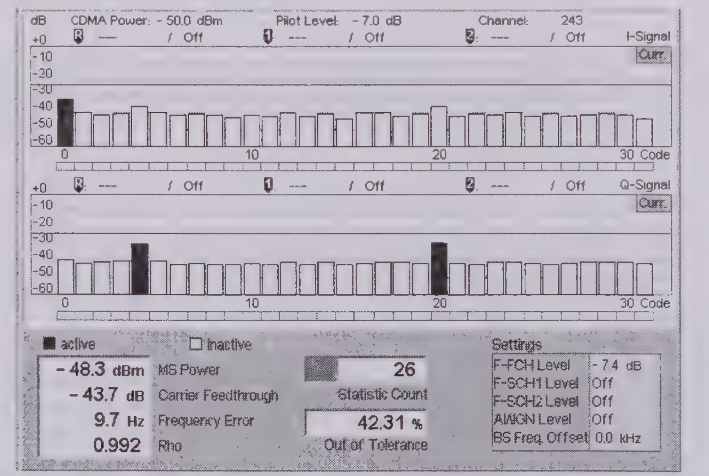
The measurement screen for Code Domain Power can be divided into three groups:

- Scalar measurement results (parameter lines)
- Bar Graph
- Measurements and Settings

Parameter line

Measurement graph

Info box



CDMA Power: - 50.0 dBm Pilot Level: - 7.0 dB Channel: 243

- 48.3 dBm MS Power
- 43.7 dB Carrier Feedthrough
9.7 Hz Frequency Error
0.992 Rho

26 Statistic Count

42.31 % Out of Tolerance

Settings

F-FCH Level	- 7.4 dB
F-SCH1 Level	Off
F-SCH2 Level	Off
AWGN Level	Off
BS Freq. Offset	0.0 kHz

Figure 4-41: Display of measurement results (Peak Code Domain Error Power screen)

Parameter line

The parameter line contains the position of each active marker. Off is displayed if the marker is not active.

R	Level and time of reference marker
1	Level and time of marker 1 (setting *absolute*) and/or difference from reference marker (setting *relative*)
2	Level and time of marker 2 (setting *absolute*) and/or difference from reference marker (setting *relative*)

Remote control

```
READ[:SCALar]:CDPOWer:CDPW?
FETCh[:SCALar]:CDPOWer:CDPW?
SAMPle[:SCALar]:CDPOWer:CDPW?
```

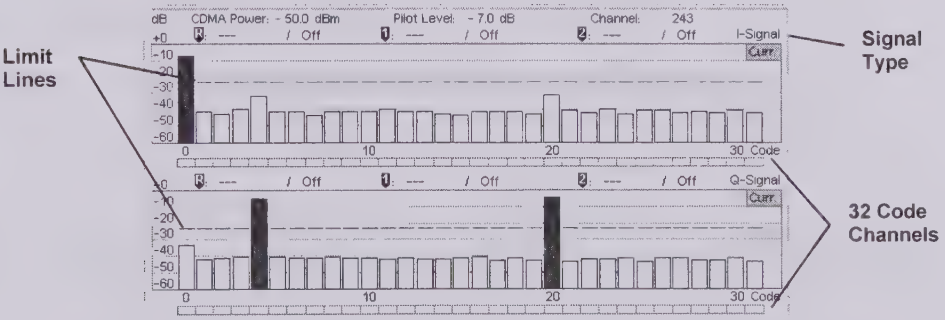
Measurement Bar Graphs

The *Measurement bar graph* is displays the power of each channel together with the limit lines and all active markers.

The bar graph either shows the current, average, or maximum levels as set in the configuration menu.

The limit lines provide a quick reference point to view channels exceeding set limits. The limit line level is set in the Configuration Menu.

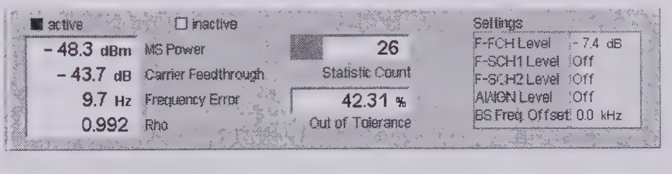
The active channels are indicated with a solid bar graph while the inactive are outlined.



CDMA Power: - 50.0 dBm
Pilot Level: - 7.0 dB
Channel: 243

Measurements and Settings

This area displays the results of power and waveform quality measurements. Measurements in red indicate they exceed the limit set in the Configuration Menu.



■ active ☐ inactive

- 48.3 dBm	MS Power	26	Statistic Count
- 43.7 dB	Carrier Feedthrough	42.31 %	Out of Tolerance
9.7 Hz	Frequency Error		
0.992	Rho		

Settings

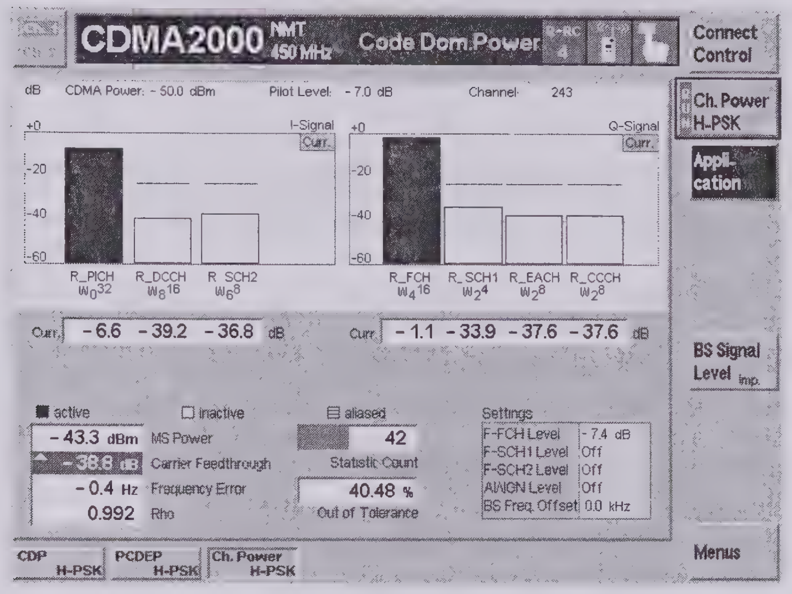
F-FCH Level	- 7.4 dB
F-SCH1 Level	Off
F-SCH2 Level	Off
AWGN Level	Off
BS Freq. Offset	0.0 kHz

MS Power	*MS Power* is the total transmitted power level from the mobile station.
Carrier Feedthrough	*Carrier Feedthrough* refers to the origin offset, which is the magnitude of the RF carrier relative to the magnitude of the modulated carrier.
Frequency Error	*Frequency Error* is the difference between the nominal frequency of the selected channel and the measured frequency.
Rho	*Rho* is the ratio of the correlated power to the total power. The correlated power is a calculated vector between a corrected

	signal and an ideal reference. The corrected signal is created by removing phase, frequency, and timing offsets.
Statistic Count	*Statistic Count* defines the length of the statistic cycles in waveform intervals/evaluation periods. 1 to 1000 Number of intervals per statistic cycle.
Out of Tolerance	*Out of Tolerance* is the percentage of waveform intervals that exceed the defined limits.
Settings	The *Settings* window lists the most important settings made in either the Configuration Menu or the hotkeys.

Channel Power

Channel Power (Ch. Power H-PSK) is the power of the reverse physical channels of both the I and Q signal.


CDMA2000
NMT 450 MHz
Code Dom.Power
R-RC 4
Connect Control
Ch. Power H-PSK
Appli-cation
BS Signal Level imp.
Menus
dB
+0
-20
-40
-60
I-Signal
Q-Signal
Curr.
R_PICH W_0^{32}
R_DCCH W_8^{16}
R SCH2 W_6^8
R_FCH W_4^{16}
R_SCH1 W_2^4
R_EACH W_2^8
R_CCCH W_2^8
■ active
☐ inactive
⊟ aliased
CDP H-PSK
PCDEP H-PSK
Ch. Power H-PSK

CDMA Power: - 50.0 dBm
Pilot Level: - 7.0 dB
Channel: 243

Curr. - 6.6 - 39.2 - 36.8 dB
Curr. - 1.1 - 33.9 - 37.6 - 37.6 dB

- 43.3 dBm MS Power
- 38.8 dB Carrier Feedthrough
- 0.4 Hz Frequency Error
0.992 Rho

42 Statistic Count
40.48 % Out of Tolerance

Settings

F-FCH Level	- 7.4 dB
F-SCH1 Level	Off
F-SCH2 Level	Off
AWGN Level	Off
BS Freq. Offset	0.0 kHz

Figure 4-42: Measurement menu Code Domain Power – Channel Power

The *Channel Power* application includes the following softkeys/hotkeys.

BS Signal Level

CDMA Power

The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level. This is a common setting used for each of the Code Domain Power applications.

Remote control `CONFigure:CDPower:CPCCommon:CONTrol:POWer:CDMA[?]` *`<CDMA Power>`*

F-FCH Level

The *F-FCH Level* hotkey adjusts the Fundamental Channel level in the forward CDMA channel. This is a common setting used for each of the Code Domain Power applications.

The *F-FCH Level* hotkey specifies the FULL frame rate traffic channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		RC 2		RC 3, 4		RC 5	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control `CONFigure:CDPower:CPCCommon:CONTrol:LEVel[?]` `<FCH Level>, <Pilot Level>`

F-PICH Level

The *F-PICH Level* hotkey adjusts the signal level of the Pilot Channel in the forward CDMA channel relative to the total output power. This is a common setting used for each of the Code Domain Power applications.

Remote control

```
CONFigure:CDPower:CPCCommon:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>
```

Impairm.

AWGN Level

The *AWGN* hotkey activates and adjusts the Additive White Gaussian Noise (AWGN) generator. Refer to page 4.34 for additional information. This is a common setting used for each of the Code Domain Power applications.

Remote control

```
CONFigure:CDPower:CPCCommon:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

BS Freq. Offset

The *BS Freq. Offset* hotkey adjusts the carrier frequency of the Base Station. This is a common setting used for each of the Code Domain Power applications.

Remote control

```
CONFigure:CDPower:CPCCommon:IMPairments[?]
<AWGN Level>, <BS Freq Offset>
```

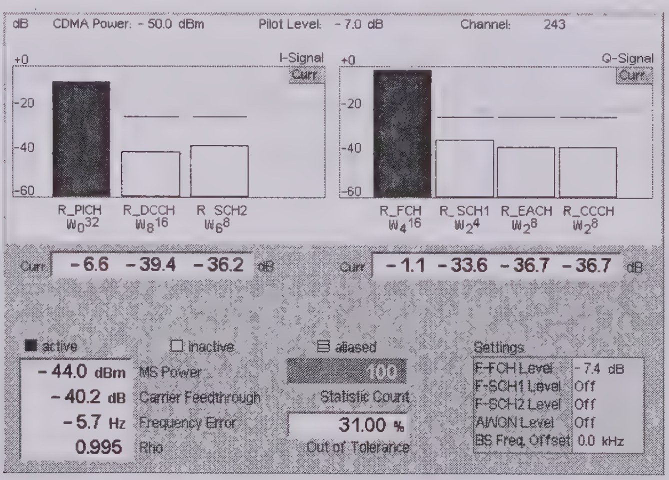
The measurement screen for Code Domain Channel Power can be divided into three groups:

- Scalar measurement results (parameter lines)
- Bar Graph
- Measurements and Settings

Parameter line

Measurement bar graph

Measurements and settings



dB CDMA Power: - 50.0 dBm Pilot Level: - 7.0 dB Channel: 243

Curr -6.6 -39.4 -36.2 dB

Curr -1.1 -33.6 -36.7 -36.7 dB

■ active ☐ inactive ⊟ aliased

- 44.0 dBm	MS Power
- 40.2 dB	Carrier Feedthrough
- 5.7 Hz	Frequency Error
0.995	Rho

100 Statistic Count

31.00 % Out of Tolerance

Settings

F-FCH Level	- 7.4 dB
F-SCH1 Level	Off
F-SCH2 Level	Off
AWGN Level	Off
BS Freq. Offset	0.0 kHz

Figure 4-43: Display of measurement results (Channel Power screen)

Parameter line The parameter line contains the position of each active marker. Off is displayed if the marker is not active.

R	Level and time of reference marker
1	Level and time of marker 1 (setting *absolute*) and/or difference from reference marker (setting *relative*)
2	Level and time of marker 2 (setting *absolute*) and/or difference from reference marker (setting *relative*)

Remote control

```
READ[:SCALar]:POWer:CHPW?
FETCh[:SCALar]:POWer:CHPW?
SAMPle[:SCALar]:POWer:CHPW?
```

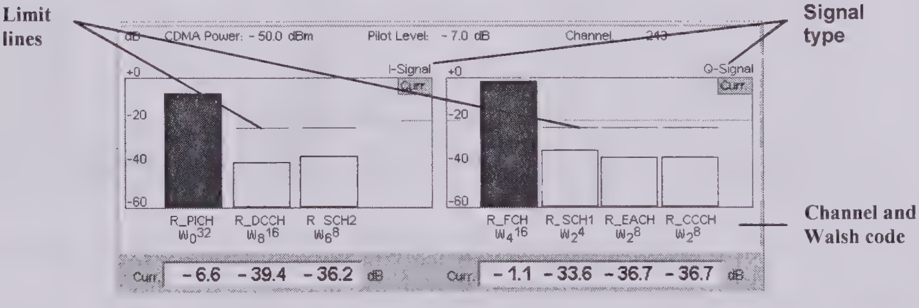
Measurement Bar Graphs The *Measurement bar graph* is displays the power of each channel together with the limit lines and all active markers.

The bar graph either shows the current, average, or maximum levels as set in the configuration menu.

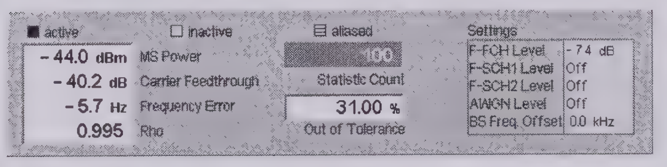
The limit lines provide a quick reference point to view channels exceeding set limits. The limit line level is set in the Configuration Menu.

The active channels are indicated with a solid bar graph while the inactive are outlined. Aliased channels are indicated with a lined bar graph.

Below each bar graph is its measured value.


Limit lines
Signal type
dB
CDMA Power: - 50.0 dBm
Pilot Level: - 7.0 dB
Channel 243
I-Signal
Q-Signal
Curr
+0
-20
-40
-60
R_PICH W_0^{32}
R_DCCH W_8^{16}
R SCH2 W_6^8
R_FCH W_4^{16}
R_SCH1 W_2^4
R_EACH W_2^8
R_CCCH W_2^8
Channel and Walsh code
Curr.
- 6.6 - 39.4 - 36.2 dB
Curr.
- 1.1 - 33.6 - 36.7 - 36.7 dB

Measurements and Settings This area displays the results of power and waveform quality measurements. Measurements in red indicate they exceed the limit set in the Configuration Menu.


■ active
☐ inactive
▤ aliased
Statistic Count
Out of Tolerance
Settings

- 44.0 dBm MS Power
- 40.2 dB Carrier Feedthrough
- 5.7 Hz Frequency Error
0.995 Rho

31.00 % Out of Tolerance

F-FCH Level	- 7.4 dB
F-SCH1 Level	Off
F-SCH2 Level	Off
AWGN Level	Off
BS Freq. Offset	0.0 kHz

MS Power	*MS Power* is the total transmitted power level from the mobile station.
Carrier Feedthrough	*Carrier Feedthrough* refers to the origin offset, which is the magnitude of the RF carrier relative to the magnitude of the modulated carrier.
Frequency Error	*Frequency Error* is the difference between the nominal frequency of the selected channel and the measured frequency.
Rho	*Rho* is the ratio of the correlated power to the total power.

The correlated power is a calculated vector between a corrected signal and an ideal reference. The corrected signal is created by removing phase, frequency, and timing offsets.

Statistic Count	*Statistic Count* defines the length of the statistic cycles in waveform intervals/evaluation periods. 1 to 1000 Number of intervals per statistic cycle.
Out of Tolerance	*Out of Tolerance* is the percentage of waveform intervals that exceed the defined limits.
Settings	The *Settings* window lists the most important settings made in either the Configuration Menu or the hotkeys.

Code Domain Power Configuration

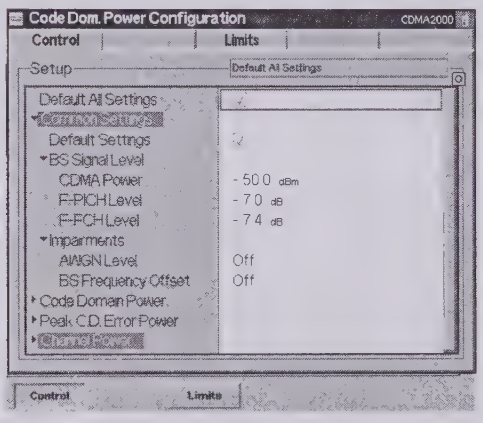
The popup menu *Code Domain Power Configuration* contains index cards that define the parameters of each code domain power application.

Pressing the measurement softkey twice (once if already selected) opens the popup menu *Code Domain Power Configuration*. Use the hotkeys at the bottom of the screen to change between the index cards. Use the *EXP/CMP* front panel key to expand or compress the list of displayed settings.

Code Domain Power Configuration – Control

The *Control* tab controls each of the measurement applications. Each application lists the available settings for controlling the measurement.

The control settings consist of both Common settings (settings that affect all code domain power applications) followed by settings specific to an application.



Default All Settings	✓
Common Settings	
Default Settings	✓
BS Signal Level	
CDMA Power	-50.0 dBm
F-PICH Level	-7.0 dB
F-FCH Level	-7.4 dB
Impairments	
AWGN Level	Off
BS Frequency Offset	Off
Code Domain Power	
Peak C.D. Error Power	
[illegible]	

Figure 4-44: Code Domain Power Configuration – Control (common settings)

Each available setting is described below. All settings may not be available for all power measurement applications.

Default All Settings	The *Default All Settings* switch assigns default values to all parameters of the modulation *Control* tab.
Common Settings	
Default Settings	Default Settings switch assigns default values to all the common parameters of the modulation *Control* tab.
BS Signal Level	
CDMA Power	*CDMA Power* sets the total CDMA output power. The CDMA Power level does not include the AWGN power level. This is a common setting used for each of the Code Domain Power applications.
Remote control	`CONFigure:CDPower:CPCCommon:CONTrol:POWer:CDMA[?]` *`<CDMA Power>`*

F-PICH Level

F-PICH Level adjusts the signal level of the Pilot Channel in the forward CDMA channel. This is a common setting used for each of the Code Domain Power applications.

F-FCH Level

The *F-FCH Level* adjusts the signal level of the Fundamental Channel in the forward CDMA channel. This is a common setting used for each of the Code Domain Power applications.

The *F-FCH Level* specifies the FULL frame rate fundamental channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		**RC 2**		**RC 3, 4**		**RC 5**	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control

`CONFigure:CDPower:CPCCommon:CONTrol:LEVel[?]`
`<FCH Level>, <Pilot Level>`

Impairments

AWGN Level

AWGN Level turns on the Additive White Gaussian Noise generator. Refer to page 4.34 for additional information.

Remote control

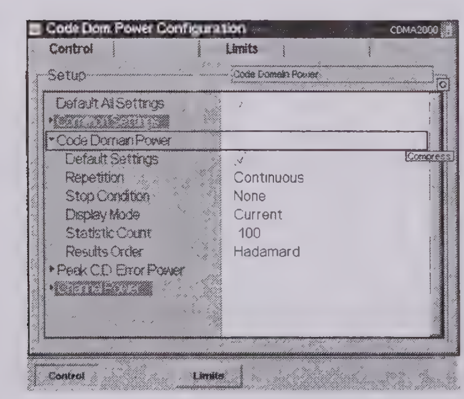
`CONFigure:CDPower:CPCCommon:IMPairments[?]`
`<AWGN Level>, <BS Freq Offset>`

BS Frequency Offset

BS Frequency Offset adjusts the carrier frequency of the Base Station.

Remote control

`CONFigure:CDPower:CPCCommon:IMPairments[?]`
`<AWGN Level>, <BS Freq Offset>`



Setting	Value
Default Settings	✓
Repetition	Continuous
Stop Condition	None
Display Mode	Current
Statistic Count	100
Results Order	Hadamard

Figure 4-45: Code Domain Power Configuration – Control (application specific)

Each available setting is described below. All settings may not be available for all code domain power measurement applications.

Default Settings The *Default Settings* assigns default values to all parameters of the *Control* index card for the individual measurement.

Code Domain Power

Repetition

Repetition determines the repetition mode.

Single Shot	The measurement is stopped after a statistic cycle, i.e. after the number of waveform intervals/evaluation periods set in the configuration menu *Statistics*. The *Stop Condition* setting may stop the measurement before completion of a cycle. A stopped measurement is indicated by the status display *HLT* in the measurement softkey. Single shot should be selected if only a single measurement result is required under fixed conditions.
Continuous	The CMU continues the measurement until it is terminated explicitly or until the stop condition is met. The measurement results are valid after one statistic cycle; however, the measurement is continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the measurement softkey. The continuous measurement is suitable for monitoring the evolution of a measured quantity in time, for example when performing adjustments.

> ***Note:** In remote mode, the counting measurement (counting mode) is available as a further measurement mode with a defined number of measurement cycles to be performed, refer to chapter 6 of this manual.*
>
> *The Stop Condition setting can affect the Single Shot and Continuous repetition modes.*

Remote control

```
CONFigure:CDPower:CDPW:CONTrol:REPetition[?]
CONFigure:CDPower:PCDEP:CONTrol:REPetition[?]
CONFigure:CDPower:CHPW:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>
```

Stop Condition

Stop Condition selects one of two stop conditions for the measurement:

NONE	The measurement continues even if tolerances are exceeded
On Limit Failure	The measurement is stopped when a tolerance is exceeded

> ***Note:** The stop condition may affect the single-shot and continuous measurement repetition modes.*

Remote control

```
CONFigure:CDPower:CDPW:CONTrol:REPetition[?]
CONFigure:CDPower:PCDEP:CONTrol:REPetition[?]
CONFigure:CDPower:CHPW:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>
```

Display Mode

Display Mode sets which measurement values are displayed as a graph.

Current	Measured value for the current waveform interval
Max/Min	Extreme value over a number of waveform intervals.
Average	Average value over a number of waveform intervals

The number of cycles for the calculation of the statistic values *Minimum/Maximum* and *Average* depends on the repetition mode set in the *Control* tab.

Single shot:	Display of minimum, maximum and average value from the performed statistic cycle.
Continuous:	Display of minimum and maximum values from all waveform intervals already measured. The average value refers to the last statistic cycle using a sliding window effect.

Statistic Count

Statistic Count defines the length of the statistic cycles in waveform intervals/evaluation periods.

1 to 1000	Number of intervals per statistic cycle.

Remote control

```
CONFigure:CDPower:CDPW:CONTrol:STATistics[?]
CONFigure:CDPower:PCDEP:CONTrol:STATistics[?]
CONFigure:CDPower:CHPW:CONTrol:STATistics[?]
<Current Statistics >
```

Results Order

Results Order defines the method used to display the code channels. This setting is only available for Code Domain and Peak Code Domain Error measurement applications.

Hadamard	The code channels are displayed in order determined by the Hadamard matrix.
Bit reverse	The code channels are displayed so that the related code channels are adjacent to each other.

Remote control

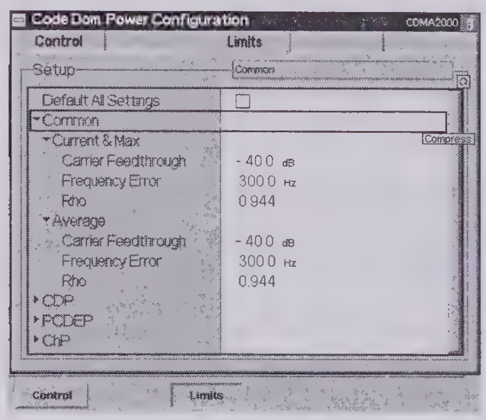
```
CONFigure:CDPower:CDPW:CONTrol:RORDer[?]
CONFigure:CDPower:PCDEP:CONTrol:RORDer[?]
HADamard | BITReverse
```

Code Domain Power Configuration – Limits

The *Limits* tab defines tolerance limits for each of the Code Domain Power measurement applications.

The limits settings consist of both Common settings (settings that affect all code domain power applications) and then settings specific to an application.

Code Domain Power Limits (Common)



Default All Settings	☐
Common	
Current & Max	
Carrier Feedthrough	-40.0 dB
Frequency Error	300.0 Hz
Rho	0.944
Average	
Carrier Feedthrough	-40.0 dB
Frequency Error	300.0 Hz
Rho	0.944
CDP	
PCDEP	
ChP	

Figure 4-46: Code Domain Power Configuration – (common)

Default All Settings The *Default All Settings* switch assigns default values to all parameters of the modulation *Limits* tab.

Common

Current & Max Sets the limits used when the display is set to the Current or Min/Max display mode.

Carrier Feedthrough Upper limit for the difference between magnitude of the RF carrier and the modulated carrier.

Frequency Error Upper limit for the difference between the measured and the expected frequency of the signal.

Rho Upper limit of the ratio of the correlated power and the total power.

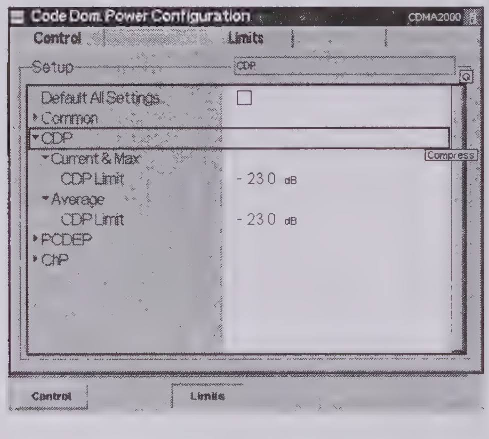
Remote control

```
CONFigure:CDPower:CPCCommon:CMAX:LIMit:ASYMmetric
[:COMBined][?]
<Carrier Feedthrough Limit>, <Freq Error Limit>, <Rho
Limit>
```

Average Sets the limits used when the display is set to the Average display mode. The available settings are the same as described for the Current & Max display mode.

Remote control

```
CONFigure:CDPower:CPCCommon:AVERage:LIMit:ASYMmetric
[:COMBined][?]
<Carrier Feedthrough Limit>, <Freq Error Limit>, <Rho
Limit>
```



Default All Settings ☐

CDP Limit -23.0 dB

CDP Limit -23.0 dB

Figure 4-47: Code Domain Power Configuration – (application specific)

Default Settings

Default Settings assigns default values to all parameters of the *Control* index card for the individual measurement.

CDP

CDP contains the limit settings applicable to the *Code Domain Power*.

Current & Max

Sets the limits used when the display is set to the Current or Min/Max display mode.

CDP Limit

Value (and placement) of the limit line displayed on the measurement screen.

Remote control

```
CONFigure:CDPower:CDPW:CMax:LIMit:ASYMmetric
[:COMBined][?]
<CDP Limit Y>
```

Average

Sets the limits used when the display is set to the Average display mode. The available settings are the same as described for the Current & Max display mode.

Remote control

```
CONFigure:CDPower:CDPW:AVERage:LIMit:ASYMmetric
[:COMBined][?]
<CDP Limit Y>
```

PCDEP

PCDEP contains the limit settings applicable to the *Peak Code Domain Error Power*. The available settings are the same as described for the *CDP*.

Remote control

```
CONFigure:CDPower:PCDEP:CMax:LIMit:ASYMmetric
[:COMBined][?]
CONFigure:CDPower:PCDEP:AVERage:LIMit:ASYMmetric
[:COMBined][?]
<CDP Limit Y>
```

CHP

CHP contains the limit settings applicable to the *Channel Power*. The available settings are the same as described for the *CDP*.

Remote control

```
CONFigure:CDPower:CHPW:CMax:LIMit:ASYMmetric
[:COMBined][?]
CONFigure:CDPower:CHPW:AVERage:LIMit:ASYMmetric
[:COMBined][?]
<CDP Limit Y>
```

Receiver Quality Measurements

The menu group *Receiver Quality* measures parameters that characterize the transmission quality of the complete transmission path from the CMU to the device under test (mobile station) and back. Assuming no transmitter errors, this allows assessment of the mobile station's receiver performance at various RF power levels.

The measurements in the menu group *Receiver Quality* require an established call (signalling state *Call Established)* in the Loopback Service mode. Receiver Quality measurements cannot be performed in the Speech Service mode.

The Receiver Quality measurements are based on the comparison of the output signal sent by the CMU with the signal received and decoded by the device under test (mobile station).

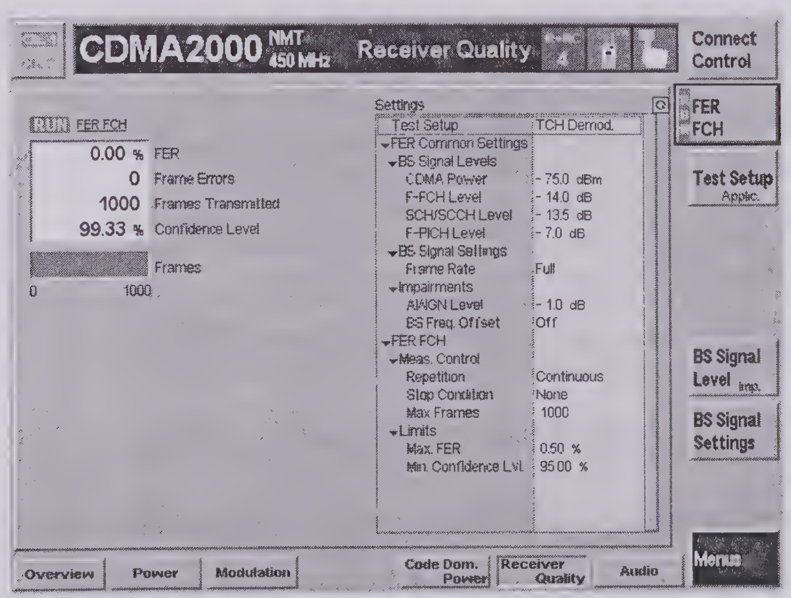
The mobile station must return the received signal to the CMU in loop back mode.

Because of the higher signal level, the transmission errors produced on the way back (from the mobile station to the CMU) can usually be neglected. However, frames destroyed on the way back are detected in a cyclic redundancy check (CRC) and counted. They are not taken into account in the calculation of transmission errors.

The quality of the mobile station transmitter can be tested separately in the *Modulation* measurement.

The *Receiver Quality* measurement is typically activated by pressing the *Receiver Quality* hotkey (see Figure 4-48).

> ***Note:*** *This menu is also directly accessible from the main menu screen.*



RUN FER FCH

0.00 %	FER
0	Frame Errors
1000	Frames Transmitted
99.33 %	Confidence Level

Settings

Test Setup	TCH Demod.
FER Common Settings	
BS Signal Levels	
CDMA Power	- 75.0 dBm
F-FCH Level	- 14.0 dB
SCH/SCCH Level	- 13.5 dB
F-PICH Level	- 7.0 dB
BS Signal Settings	
Frame Rate	Full
Impairments	
AWGN Level	- 1.0 dB
BS Freq. Offset	Off
FER FCH	
Meas. Control	
Repetition	Continuous
Stop Condition	None
Max Frames	1000
Limits	
Max. FER	0.50 %
Min. Confidence Lvl.	95.00 %

Measurement softkey

Figure 4-48: Receiver Quality Measurement menu

The measurement softkey indicates status of the measurement *(RUN | HLT | OFF)* and opens the configuration menu *Receiver Quality Configuration.*

Softkey Selections

Measurement softkey

The measurement softkey activates a set of hotkeys to select a modulation application.

Repetition
Stop Condition
Max. Frames

Repetition

The *Repetition* hotkey displays a popup window to select the repetition mode of the measurement between continuous and single shot.

Single Shot	The measurement is stopped after a statistic cycle, i.e. after the number of waveform intervals/evaluation periods set in the configuration menu *Statistics*. The *Stop Condition* setting may stop the measurement before completion of a cycle. A stopped measurement is indicated by the status display *HLT* in the measurement softkey. Single shot should be selected if only a single measurement result is required under fixed conditions.
Continuous	The CMU continues the measurement until it is terminated explicitly or until the stop condition is met. The measurement results are valid after one statistic cycle; however, the measurement is continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the measurement softkey. The continuous measurement is suitable for monitoring the evolution of a measured quantity in time, for example when performing adjustments.

***Note:** In remote mode, the counting measurement (counting mode) is available as a further measurement mode with a defined number of measurement cycles to be performed, refer to chapter 6 of this manual.*

The Stop Condition setting can affect the Single Shot and Continuous repetition modes.

Remote control

```
CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>
```

Stop Condition

The *Stop Condition* hotkey selects one of two stop conditions for the measurement:

NONE:	Continue measurement even if set limits have been exceeded.
On Limit Failure:	Stop measurement if a set limit has been exceeded (tolerance exceeded).

The stop conditions may affect single-shot and continuous measurement settings.

Remote control

```
CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>
```

Max Frames

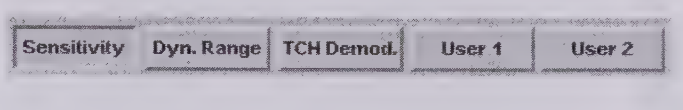
The *Max. Frame* hotkey displays a popup window to set the maximum number of frames.

Remote control

```
CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:FRAMes[?]
<Frame Count>
```

Test Setup

The *Test Setup* softkey displays a set of hotkeys to select one of the test setups to use as the parameters for the receiver quality test.



Sensitivity

The *Sensitivity* hotkey contains predefined parameter settings to test the receiver quality as defined in standard TIA/EIA IS-2000 for sensitivity testing.

Dyn. Range

The *Dynamic Range* hotkey contains predefined parameter settings to test the receiver quality as defined in standard TIA/EIA IS-2000 for dynamic range testing.

TCH Demod

The *Traffic Channel Demodulation* hotkey contains predefined parameter settings to test the receiver quality as defined in standard TIA/EIA IS-2000 for traffic channel demodulation testing.

User 1

The *User 1* hotkey is available to store user defined parameters to test receiver quality.

User 2

The *User 2* hotkey is available to store user defined parameters t test receiver quality.

Impairm

The *Impairments* softkey displays a set of hotkeys to adjust the AWGN and BS frequency offset.

AWGN Level

The *AWGN* hotkey activates and adjusts the Additive White Gaussian Noise (AWGN) generator. Refer to page 4.34 for additional information. This is a common setting between all Receiver Quality test setups.

Remote control

```
CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:IMPairm
ents[?]
<AWGN Level>, <BS Frequency Offset>
```

BS Freq. Offset

The *BS Freq Offset* hotkey adjusts the carrier frequency of the Base Station. This is a common setting between all Receiver Quality test setups.

Remote control

```
CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:IMPairments[?]
<AWGN Level>, <BS Frequency Offset>
```

BS Signal Levels

The *BS Signal Levels* softkey displays a set of hotkeys to adjust the CDMA power and channel levels.

CDMA Power

The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level. This is a common setting between all Receiver Quality test setups.

Remote control

```
CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:POWer:CDMA[?]
<CDMA Power>
```

F-FCH Level

The *F-FCH Level* hotkey adjusts the signal level of the Fundamental Channel in the forward CDMA channel. This is a common setting between all Receiver Quality test setups.

The *F-FCH Level* specifies the FULL frame rate fundamental channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		**RC 2**		**RC 3, 4**		**RC 5**	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control

```
CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:LEVel:FFCH[?]
<FCH Level>
```

F-PICH Level

The *F-PICH Level* hotkey adjusts the signal level of the Pilot Channel in the forward CDMA channel relative to the total output power. This is a common setting between all Receiver Quality test setups.

Remote control

```
CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:LEVel:FPICh[?]
<Pilot Level>
```

BS Signal Settings

The *BS Signal Settings* softkey displays a hotkey to adjust the frame rate.

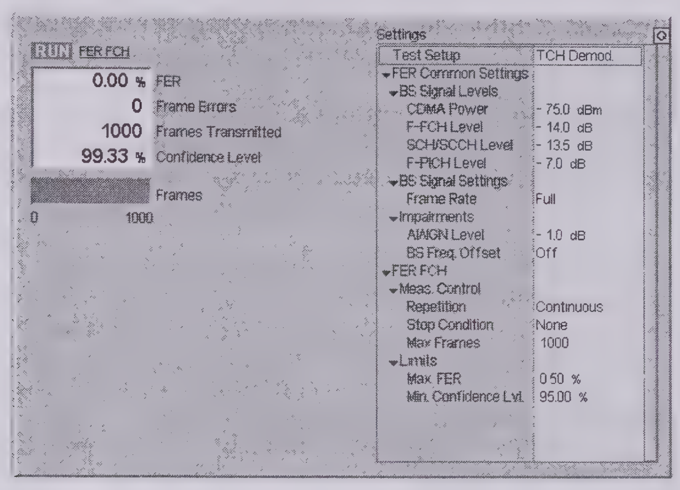
Frame Rate

The *Frame Rate* hotkey displays a popup window to set the frame rate to Full, Half, Quarter, or Eighths. This is a common setting between all Receiver Quality test setups.

Remote control

```
CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:FRATe:FFCH[?]
<Frame Rate>
```

Measurement Results



0.00 % FER
0 Frame Errors
1000 Frames Transmitted
99.33 % Confidence Level

Test Setup	TCH Demod.
FER Common Settings	
BS Signal Levels	
CDMA Power	- 75.0 dBm
F-FCH Level	- 14.0 dB
SCH/SCCH Level	- 13.5 dB
F-PICH Level	- 7.0 dB
BS Signal Settings	
Frame Rate	Full
Impairments	
AWGN Level	- 1.0 dB
BS Freq. Offset	Off
FER FCH	
Meas. Control	
Repetition	Continuous
Stop Condition	None
Max Frames	1000
Limits	
Max. FER	0.50 %
Min. Confidence Lvl.	95.00 %

Figure 4-49: Measurement Display Results (Receiver Quality)

FER	*FER* displays the percentage of the Frame Error Rate over the total number of received frames.
Frame Errors	*Frame Errors* lists the total number of frame errors.
Frames Received	*Frames Received* lists the total number of frames received. This number is used for the calculation of the FER.
Confidence Level	*Confidence Level* indicates the statistical probability that the true FER is within limits based on the current number of frame errors compared to the number of frames received.
Frames	*Frames* is a bar graph indicating the measurement progress.

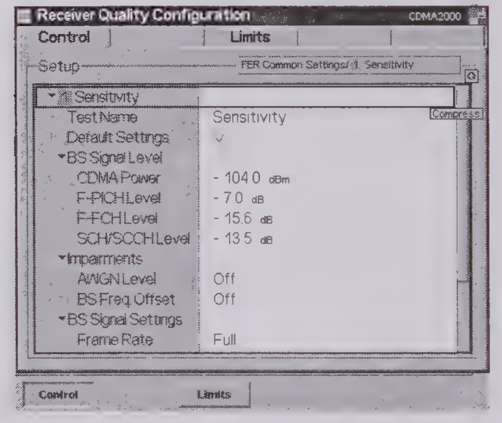
Receiver Quality Configurations

The popup menu *Receiver Quality Configuration* contains three tabs to set the parameters of the receiver Quality measurements.

Pressing the measurement softkey at the top right in the measurement menu activates the popup menu Receiver Quality Configuration. It is possible to change between the index cards by pressing the associated hotkeys. Use the EXP/CMP key to expand or compress the list of settings displayed.

Receiver Quality Configuration – Control

The *Control* tab contains all user adjustable configuration parameters to control each receiver quality measurement. The *Control* tab has two major divisions, *FER Common Settings* and *FERFCH*. The Common Settings adjust signal levels for each test type and allows the user to create and name new test types. The FERRCH defines how the tests are performed.


Receiver Quality Configuration
CDMA2000
Control
Limits
Setup
FER Common Settings/ 1. Sensitivity
Compress
Control
Limits

1. Sensitivity	
Test Name	Sensitivity
Default Settings	✓
BS Signal Level	
CDMA Power	- 104.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 15.6 dB
SCH/SCCH Level	- 13.5 dB
Impairments	
AWGN Level	Off
BS Freq Offset	Off
BS Signal Settings	
Frame Rate	Full

Figure 4-50: Receiver Quality Configuration Control (Common Settings)

Test Name	The *Test Name* allows you to enter a descriptive name for the test based on the parameters you set. The default test names can be renamed to more accurately describe your tests or you can create two new tests using the User1 and User2 selections. The name entered here displays in the hotkey bar of the *Test Setup* softkey.
Default Settings	*Default Settings* (located below each *Test Name*) assigns default values to the parameters of the test.
BS Signal Level	
CDMA Power	*CDMA Power* sets the total CDMA output power. The CDMA Power level does not include the AWGN power level. This is a common setting between all Receiver Quality test setups.
Remote control	`CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:POWer:CDMA[?]` *`<CDMA Power>`*

F-PICH Level

F-PICH Level adjusts the signal level of the Pilot Channel in the forward CDMA channel relative to the total output power. This is a common setting between all Receiver Quality test setups.

Remote control

`CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:LEVel:FPICh[?]` *`<Pilot Level>`*

F-FCH Level

The *F-FCH Level* adjusts the signal level of the Fundamental Channel in the forward CDMA channel. This is a common setting between all Receiver Quality test setups.

The *F-FCH Level* specifies the FULL frame rate fundamental channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

	RC 1		**RC 2**		**RC 3, 4**		**RC 5**	
	bps	**dB**	**bps**	**dB**	**bps**	**dB**	**bps**	**dB**
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control

`CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:LEVel:FFCH[?]` *`<FCH Level>`*

Impairments

AWGN Level

AWGN Level turns on the Additive White Gaussian Noise generator. Refer to page 4.34 for additional information. This is a common setting between all Receiver Quality test setups.

Remote control

`CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:IMPairments[?]` *`<AWGN Level>, <BS Frequency Offset>`*

BS Frequency Offset

BS Frequency Offset adjusts the carrier frequency of the Base Station. This is a common setting between all Receiver Quality test setups.

Remote control

`CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:IMPairments[?]` *`<AWGN Level>, <BS Frequency Offset>`*

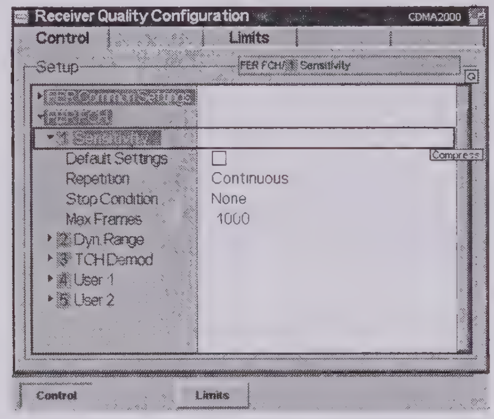
BS Signal Level

Frame Rate

Frame Rate sets the frame rate to Full, Half, Quarter, or Eighth. This is a common setting between all Receiver Quality test setups.

Remote control

`CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:FRATe:FFCH[?]` *`<Frame Rate>`*



Default Settings ☐
Repetition Continuous
Stop Condition None
Max Frames 1000

Figure 4-51: Receiver Quality Configuration Control (Test Settings)

Default Settings *Default Settings* (located below each application heading) assigns default values to the parameters of the specific application.

Repetition *Repetition* selects the repetition mode:

Single Shot: The measurement is stopped after a statistic cycle, i.e. after the number of frames set. A stopped measurement is indicated by the status display *HLT* in the measurement softkey. The single shot measurement may not complete if the Stop Condition is met.

Continuous: The CMU continues the measurement unless the Stop Condition for the measurement is met. The measurement results are valid after one statistic cycle; however, the measurement is continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the measurement softkey.

Single shot should be selected if only a single measurement result is required under fixed conditions. The continuous measurement is suitable for monitoring the evolution of a measured quantity over time, for example, for adjustments.

Remote control
`CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:REPetition[?]`
`<Repetition>, <Stop Cond>, <Step Mode>`

Stop Condition *Stop Condition* selects one of two stop conditions for the measurement:

NONE:	Continue the measurement even in the event of errors.
Confidence Limit Exceeded:	Stop the measurement when the confidence level exceeds the set limit. This indicates the probability that the true FER is less than the set FER limit.
Frame Limit Exceeded:	Stop the measurement when the number of frame errors exceed the set limit.
Any Limit Exceeded:	Stop the measurement if either the *Confidence Limit* or *Frame Limit* is exceeded.

The stop conditions may affect single-shot and continuous measurement settings.

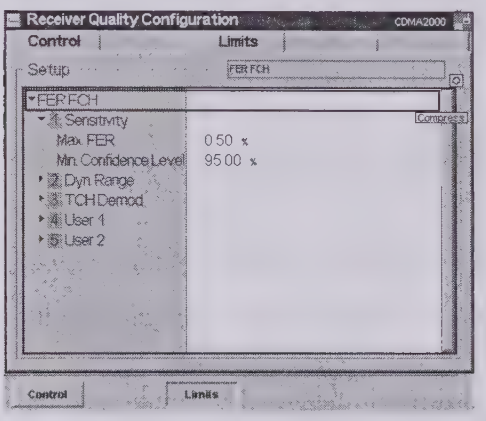
Remote control `CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:REPetition[?]` *`<Repetition>, <Stop Cond>, <Step Mode>`*

Max Frames The *Max Frames* sets the maximum number of frames used to calculate the frame error rate.

Remote control `CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:FRAMes[?]` *`<Frame Count>`*

Receiver Quality Configuration – Limits

The *Limits* tab defines tolerance limits for the maximum frame error allowed and the confidence level of the error rate.


Receiver Quality Configuration
CDMA2000
Control
Limits
Setup
FER FCH
FER FCH
1 Sensitivity
Compress
2 Dyn Range
3 TCH Demod
4 User 1
5 User 2
Control
Limits

Max. FER 0.50 %
Min. Confidence Level 95.00 %

Figure 4-52: Receiver Quality Configuration Limits

Max FER The *Max FER* sets the maximum frame error rate allowed before indicating an error.

Remote control `CONFigure:RXQuality:FER:FCH:LIMit:TSETup<nr>:MFER[?]` *`<Max FER Limit>`*

Min Confidence Level The *Min Confidence Level* sets the minimum confidence level of the error rate that must be met without indicating an error.

Remote control `CONFigure:RXQuality:FER:FCH:LIMit:TSETup<nr>:CLEVel[?]` *`<Min Confidence Level>`*

Connection Control Menu

The menu group *Connection Control* controls the signalling procedures (call setup and release, services, signalling parameters) and determines the inputs and outputs with the external attenuation values and the reference frequency.

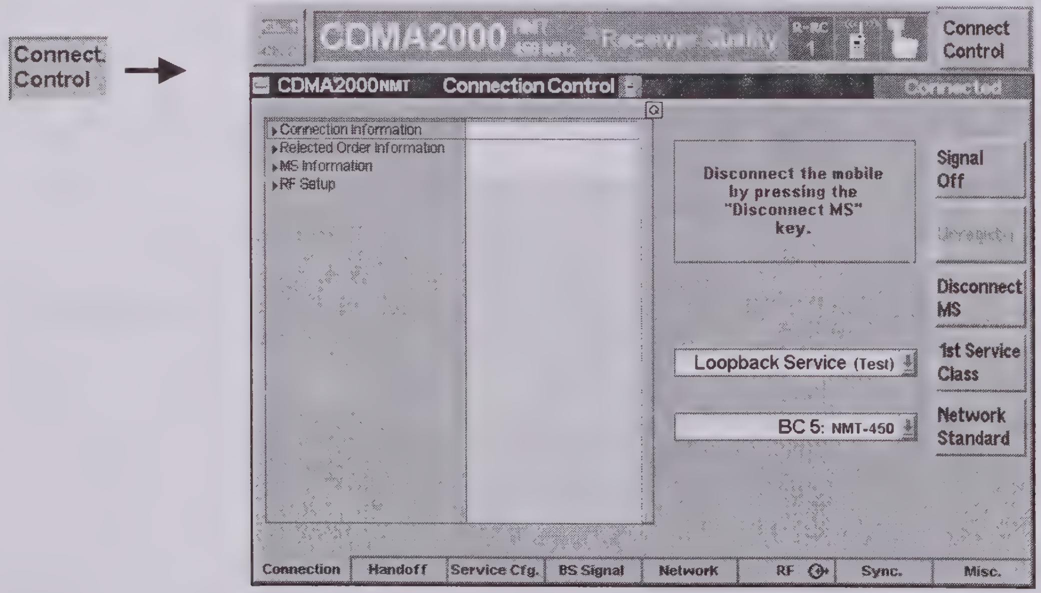
Since the measurements in signalling mode require an existing connection to a mobile station, the menus for setting up the call (*Connection Control - Connection*) appear immediately after selecting a signalling mode (unless the auto popup is disabled). The connection control menus can be accessed any time by pressing the *Connect Control* softkey at the top right corner in every measurement menu. The hotkey bar (at the bottom the screen) links the measurement menus together. Pressing the *Escape* key or the *Connect Control* softkey closes the connection control menu and the CMU changes to the measurement mode.

The tab *Connection Control - Connection* displayed during registration is described in section Call Setup (Connection Control) beginning on page 4.22. The remaining tabs of the *Connection Control* menu are described here.

Connection Control with Call Established (Connection Control – Connected)

The popup menu *Connection* provides information on the signalling parameters of the mobile station.

The softkeys *Signal Off* and *Disconnect MS* lead to different signalling states. *Signal Off* returns the CMU to the Signal Off state and *Disconnect MS* returns the CMU to the Registered state.


Connect Control
CDMA2000
Receiver Quality
Connect Control
CDMA2000NMT Connection Control
Connected
Connection Information
Rejected Order Information
MS Information
RF Setup
Signal Off
Disconnect MS
1st Service Class
Network Standard
Connection
Handoff
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

Disconnect the mobile by pressing the "Disconnect MS" key.

Loopback Service (Test)

BC 5: NMT-450

Figure 4-53: Connection Control – Connection (Call Established)

Header Message A Hader Message displayed in each Signalling index card provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Disconnect the mobile by pressing the “Disconnect MS” key` is displayed.

Information Box

In the Connected state, the information box contains all connection information, mobile information, and RF connection setup.

Signal Off

The *Signal Off* softkey switches off the RF generator. Switching the RF generator off changes the Signalling state to the Signal Off state.

Remote control

```
PROCedure:Signalling:ACTion
SOFF
```

Disconnect MS

The *Disconnect MS* softkey releases the call from CMU to the mobile station. The CMU returns to the Connection Control Registered state (refer to page 4.29).

Remote control

```
PROCedure:Signalling:ACTion
CRELease
```

1st Service Class

The *1st Service Class* softkey displays the call mode method to use when connecting to the mobile station. *Loopback Service* is generally used for testing. *Speech Service* is used to place a voice call to the mobile.

CDMA2000 receiver quality measurements require that a Loopback Service call be established with the mobile station. The Speech Service mode is used to place a voice call to the mobile. Modulation measurements may run slower in Speech Service since the mobile station signal may not be using Full Rate.

The parameters for the service types are configured in the *Service Config.* tab.

Remote control

```
CONFigure:SCONfig:SCLass[n]:SERVice[?]
PROCedure:SCONfig:SCLass[n]:SERVice[?]
LOOP | SPEech
```

Network Standard

The *Network Standard* softkey displays Network selected from the *Menu Select* screen.

Pressing the *Network Standard* softkey allows you to change between the supported band classes for the network. Refer to Chapter 1 for a list of the supported CDMA2000 networks.

Remote control

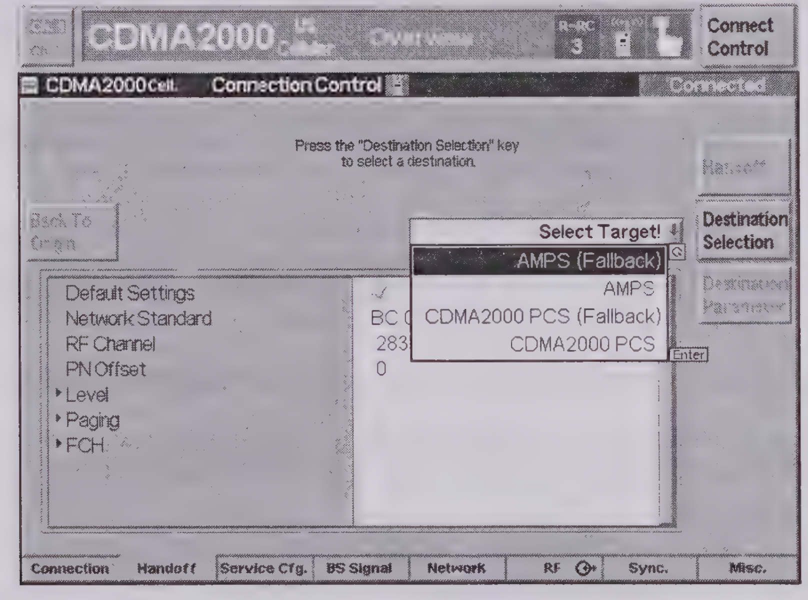
```
CONFigure:NETWork:STANDard[?]
N45T | USC | KCEL | TACS | JTAC | NA7C | NA9C | NA8S |NAPC |
KPCS | B18M | IM2K
```

Handoff to Another Network (Connection Control – Handoff)

The popup menu *Handoff* initiates a handoff of the established call to a different network. Since a call needs to be established, this menu is only available in the *Call Established* signalling state. The handoff includes:

- Selection of the target network (*Destination Selection*) and the handoff parameters (*Destination Parameter* and *Destination Defaults*)
- Start of the handoff procedure (*Handoff*)
- Display and modification of the parameters of the original network (*Origin Parameter*)

Connect. Control →


CDMA2000
Connect Control
CDMA2000Cell. Connection Control
Connected
Handoff
Back To Origin
Select Target!
AMPS (Fallback)
AMPS
CDMA2000 PCS (Fallback)
CDMA2000 PCS
Enter
Destination Selection
Destination Parameter
Default Settings
Network Standard
RF Channel
PN Offset
Level
Paging
FCH
✓
BC 0
283
0
Connection
Handoff
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

Press the "Destination Selection" key to select a destination.

Figure 4-54: Connection Control – Handoff

Header Message A Header Message displayed in each Signalling menu provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Press the "Handoff" key to perform a Handoff from the Origin to the Destination Network` is displayed.

Destination Selection

The *Destination Selection* softkey selects the target network for the handoff.

A handoff destination with fallback (e.g. AMPS Fallback) causes the CMU to return to the function group of the origin network after the call is released.

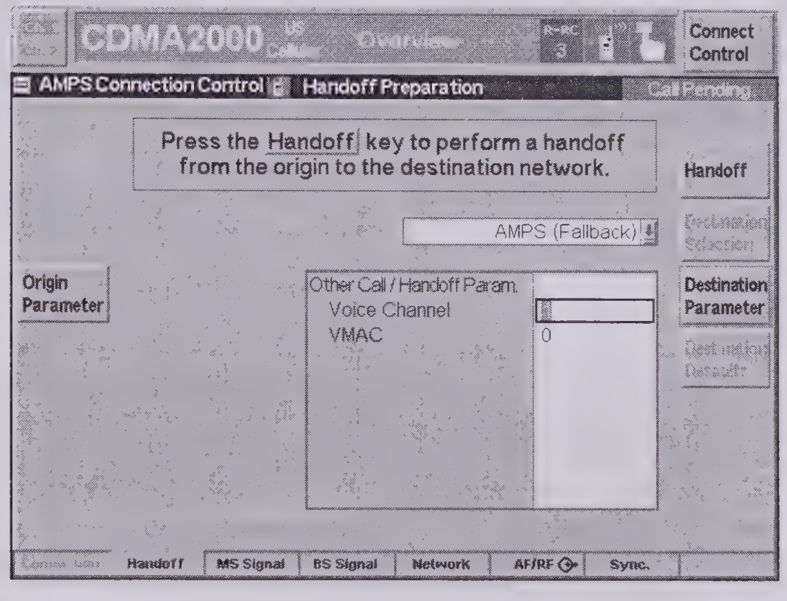
The Destination Selection list is automatically adapted to the connected mobile. From the CDMA network, a handoff to the analog (AMPS) network as well as handoffs to other CDMA bands (interband handoff) are supported.

Once the selection is confirmed (pressing the *Enter* key) the menu changes to the *Handoff Preparation* screen. The entire Connection Control menu is mapped onto the target function group making it possible to edit the *Destination* parameters, the *BS Signal*, and the *Network* parameters of the target network.

Remote control

```
CONFigure:HANDoff:TARGet[?]
"CDMA2KCellMS" | "CDMA2KPCSMS" | "CDMA2KIMT2KMS" |
"CDMA2K450MS" | "AMPSMS" | "CDMA2KCellMSFallback" |
"CDMA2KPCSMSFallback" | "CDMA2KIMT2KMSFallback" |
"CDMA2K450MSFallback" | "AMPSMSFallback"
```

Destinatio Selection →


CDMA2000
US Cellular
Overview
R-RC 3
Connect Control
AMPS Connection Control
Handoff Preparation
Call Pending
Handoff
Destination Selection
Destination Parameter
Destination Defaults
Origin Parameter
Connect Ctrl
Handoff
MS Signal
BS Signal
Network
AF/RF
Sync.

Press the Handoff key to perform a handoff from the origin to the destination network.

AMPS (Fallback)

Other Call / Handoff Param.
Voice Channel
VMAC 0

Figure 4-55: Connection Control – Handoff (destination network preparation)

Handoff

The *Handoff* softkey initiates the handoff to the target network.

Destination Parameter

The *Destination Parameter* softkey sets important network parameters of the target network necessary for the handoff.

The entries depend on the target network selected with the *Destination Selection* softkey.

Destination Defaults

The *Destination Defaults* softkey sets the parameters of the target network to default values.

The softkey is disabled if no changes have been made in the *Destination Parameter* list.

Origin Parameter

The *Origin Parameter* softkey cancels the handoff procedure and resets the CMU to the *Call Established* signalling state.

The destination parameters set in the *Call Pending* state are maintained. To drop the handoff procedure and return to the measurement mode, press the *ESCAPE* key or the *Connection Control* softkey.

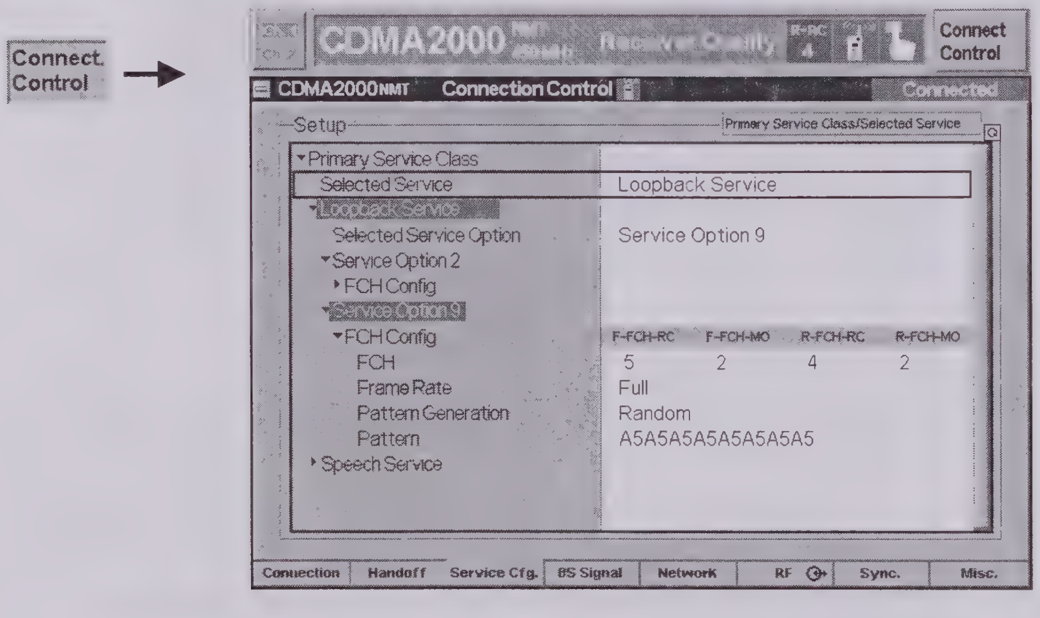
Service Configuration of the CMU (Connection Control – Service Cfg.)

The popup menu *Service Cfg.* displays the service options available for both the *Loopback Service* and *Speech Service* and allows configuration of the service options.

The *Primary Service Class* currently selected is highlighted along with the selected Service Option. The Service Class is selected in the *Connection* tab with the softkey *1st Service Class*. You must go to the *Connection* tab to change the *Primary Service Class*. The Service Options and their configurations are selected here.

The descriptions of the Service Configuration tab is divided in two sections: the Loopback Service and the Speech Service.

Loopback Service


Connect. Control
CDMA2000
Receiver Quality
R-RC 4
Connect Control
CDMA2000NMT
Connection Control
Connected
Setup
Primary Service Class/Selected Service
Connection
Handoff
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

- Primary Service Class
  - Selected Service: Loopback Service
- Loopback Service
  - Selected Service Option: Service Option 9
  - Service Option 2
    - FCH Config
  - Service Option 9
    - FCH Config
      - FCH: F-FCH-RC 5, F-FCH-MO 2, R-FCH-RC 4, R-FCH-MO 2
      - Frame Rate: Full
      - Pattern Generation: Random
      - Pattern: A5A5A5A5A5A5A5A5
- Speech Service

Primary Service Class

Selected Service	This displays the service type selected in the Connection tab screen.
Loopback Service Selected Service Option	This displays and changes the service option selected for the loopback service. The CMU supports Service Options 2 and 9.

Remote control

```
CONFigure:SCONfig:SCLass<nr>:LOOP:SOPTion[?]
PROCedure:SCONfig:SCLass<nr>:LOOP:SOPTion[?]
S02D | S09D
```

Service Option 2

Service Option 2 provides a loopback of primary traffic information bits through the mobile station using the Forward Fundamental Code Channel with Multiplex Option 1. Service Option 2 meets the requirements described in standard TIA/EIA-126-D.

FCH Config

FCH

FCH sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*).

The Multiplex Options (*F-FCH-MO* and *R-FCH-MO*) are not selectable; they are set to 1 by the Service Option 2 selection.

Remote control

```
CONFigure:SCONfig:SCLass<nr>:LOOP:SO2D:FCH:RC[?]
PROCedure:SCONfig:SCLass<nr>:LOOP:SO2D:FCH:RC[?]
<F_RC>, <R_RC>
```

Frame Rate

Frame Rate sets the frame rate to Full, Half, Quarter, or Eighth.

Remote control

```
CONFigure:SCONfig:SCLass<nr>:LOOP:SO2D:FCH:FRAT[?]
PROCedure:SCONfig:SCLass<nr>:LOOP:SO2D:FCH:FRAT[?]
EIGHth | QUARter | HALF | FULL | DEFault
```

Pattern Generation

Pattern Generation sets the type of pattern the base station generates and sends to the mobile station. *RANDOM* sends a random pattern to the mobile station and is the preferred method to obtain the best measurement performance. *FIXED* sends the bit pattern defined in the *Pattern* field.

The base station generates one fundamental data block to the mobile station. After a delay to allow for processing, the mobile station sends one reverse fundamental data block back to the base station. The base station can set the bits within a data block to a random pattern or any desired value (fixed).

Remote control

```
CONFigure:SCONfig:SCLass<nr>:LOOP:SO2D:FCH:PGEN[?]
PROCedure:SCONfig:SCLass<nr>:LOOP:SO2D:FCH:PGEN[?]
RANDom | FIXed | DEFault
```

Pattern

Pattern defines the bit pattern that the pattern generator uses to send to the mobile station for measurements. This pattern is used if *Pattern Generation* is set to *FIXED*.

Remote control

```
CONFigure:SCONfig:SCLass<nr>:LOOP:SO2D:FCH:PATTern[?]
PROCedure:SCONfig:SCLass<nr>:LOOP:SO2D:FCH:PATTern[?]
<Pattern>
```

Service Option 9

Service Option 9 provides a loopback of primary traffic information bits through the mobile station using the Forward Fundamental Code Channel with Multiplex Option 2. Service Option 9 meets the requirements described in standard TIA/EIA-126-D.

FCH Config

FCH

FCH sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*).

The Multiplex Options (*F-FCH-MO* and *R-FCH-MO*) are not selectable; they are set to 2 by the Service Option 9 selection.

Remote control

```
CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:RC[?]
PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:RC[?]
<F_RC>, <R_RC>
```

Frame Rate and Pattern

These settings perform the same as described under Service Option 2.

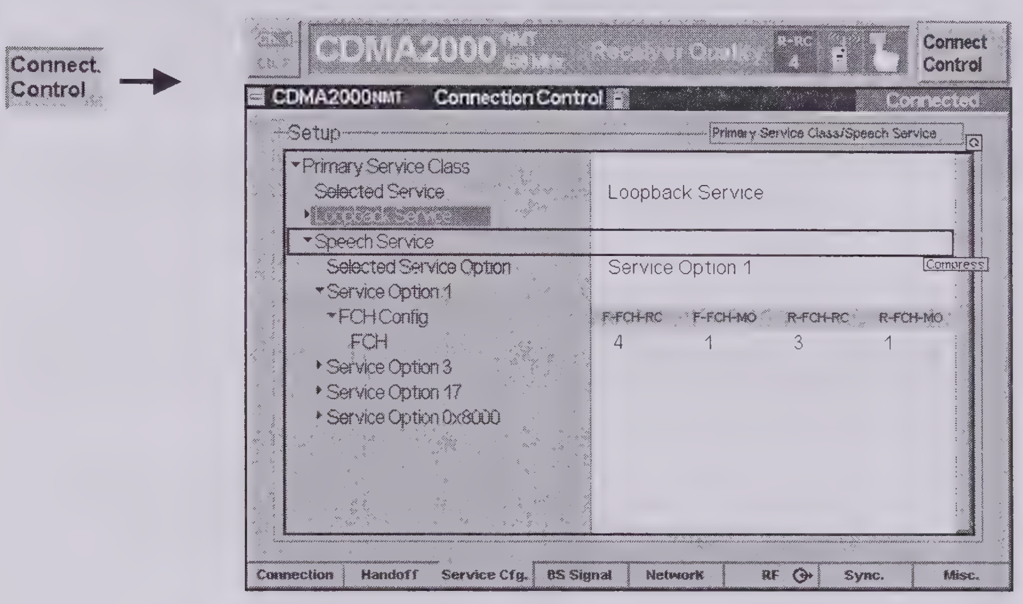
Remote control

```
CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:FRAT[?]
PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:FRAT[?]
EIGHth | QUARter | HALF | FULL | DEFault

CONFigure:SCONfig:SCLass<nr>:LOOP:S09:FCH:PGEN[?]
PROCedure:SCONfig:SCLass<nr>:LOOP:S09:FCH:PGEN[?]
RANDom | FIXed | DEFault

CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:PATTern[?]
PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:PATTern[?]
<Pattern>
```

Speech Service


Connect. Control
CDMA2000
Connect Control
CDMA2000 NMT Connection Control
Connected
Compress
Connection
Handoff
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

Setup — Primary Service Class/Speech Service

- Primary Service Class
  - Selected Service: Loopback Service
  - Loopback Service
- Speech Service
  - Selected Service Option: Service Option 1
  - Service Option 1
    - FCH Config
      - FCH

	F-FCH-RC	F-FCH-MO	R-FCH-RC	R-FCH-MO
FCH	4	1	3	1

  - Service Option 3
  - Service Option 17
  - Service Option 0x8000

Speech Service Selected Service Option

This displays and changes the service option selected for the Speech Service.

The CMU supports Service Options 1, 3, 17, and 0x8000.

Remote control

```
CONFigure:SCONfig:SCLass<nr>:SPEech:SOPTion[?]
PROCedure:SCONfig:SCLass<nr>:SPEech:SOPTion[?]
S01D | S03D | S17D | SX8T
```

Service Option 1

Service Option 1 provides a variable rate, two-way speech service to the mobile station using the Forward Fundamental Code Channel with Multiplex Option 1. Service Option 1 meets the requirements described in standard TIA/EIA-96-C.

FCH Config

FCH

FCH sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*).

The Multiplex Options (*F-FCH-MO* and *R-FCH-MO*) are not selectable; they are set to 1 by the Service Option 1 selection.

Remote control

```
CONFigure:SCONfig:SCLass<nr>:SPEech:S01D:FCH:RC[?]
PROCedure:SCONfig:SCLass<nr>:SPEech:S01D:FCH:RC[?]
<F_RC>, <R_RC>
```

Service Option 3

Service Option 3 provides an enhanced variable rate, two-way speech service to the mobile station using the Forward Fundamental Code Channel with Multiplex Option 1. Service Option 3 meets the requirements described in standard TIA/EIA/IS-127.

FCH Config

FCH

FCH sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*).

The Multiplex Options (*F-FCH-MO* and *R-FCH-MO*) are not selectable; they are set to 1 by the Service Option 3 selection.

Remote control

```
CONFigure:SCONfig:SCLass<nr>:SPEech:S03D:FCH:RC[?]
PROCedure:SCONfig:SCLass<nr>:SPEech:S03D:FCH:RC[?]
<F_RC>, <R_RC>
```

Service Option 17

Service Option 17 provides an enhanced variable rate, two-way speech service to the mobile station using the Forward Fundamental Code Channel with Multiplex Option 1. Service Option 17 meets the requirements described in standard TIA/EIA/IS-733.

FCH Config

FCH

FCH sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*).

The Multiplex Options (*F-FCH-MO* and *R-FCH-MO*) are not selectable; they are set to 2 by the Service Option 17 selection.

Remote control

```
CONFigure:SCONfig:SCLass<nr>:SPEech:S17D:FCH:RC[?]
PROCedure:SCONfig:SCLass<nr>:SPEech:S17D:FCH:RC[?]
<F_RC>, <R_RC>
```

Service Option 0x8000

Service Option 0x8000 provides an enhanced variable rate, two-way speech service to the mobile station using the Forward Fundamental Code Channel with Multiplex Option 1. Service Option 0x8000 meets the requirements described in standard CDG RF 27.

FCH Config

FCH

FCH sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*).

The Multiplex Options (*F-FCH-MO* and *R-FCH-MO*) are not selectable; they are set to 2 by the Service Option 0x8000 selection.

Remote control

```
CONFigure:SCONfig:SCLass<nr>:SPEech:SX8T:FCH:RC[?]
PROCedure:SCONfig:SCLass<nr>:SPEech:SX8T:FCH:RC[?]
<F_RC>, <R_RC>
```

Signals of the CMU (Connection Control – BS Signal)

The popup menu *BS Signal* configures the signals of the CMU (which simulates a base station transmitting a control channel and a traffic channel signal), selects frequency offset, and indicates the transmission parameters. The range of functions of the menu depends on the signalling state:

- Some signal settings must be performed before a call is sent to the mobile station. They are available in the signalling states *Signal Off, Signal On,* and *Registered.*
- Parameters of the mobile station are only available after the call has been set up (i.e. in the signalling state *Call Established*).

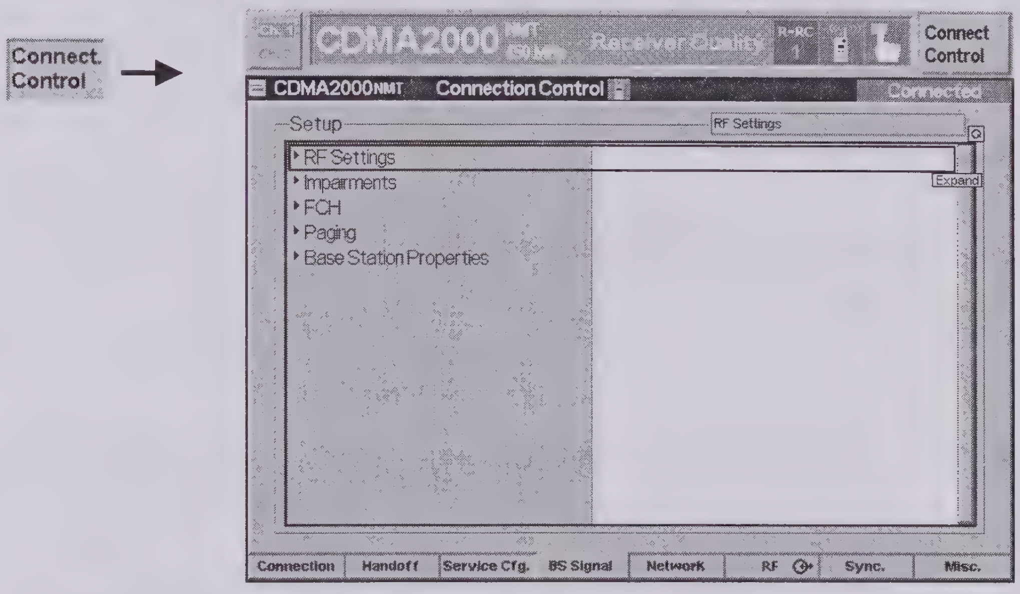

Connect. Control
CDMA2000
Receiver Quality
Connect Control
CDMA2000NMT Connection Control
Connected
Setup
RF Settings
RF Settings
Expand
Impairments
FCH
Paging
Base Station Properties
Connection
Handoff
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

Figure 4-56: Connection Control – BS Signal

RF Settings

RF Channel	The *RF Channel* sets the base station channel number (and frequency) of the generated RF signal. Changing the RF Channel resets the RF Frequency setting. The default settings for the channel numbers are dependent on the network selected. See Chapter 1 for a list of the networks and standards supported by the CMU with the CDMA options.

Remote Control	`CONFigure:BSSignal:CHANnel:FFCH[?]`
	`PROCedure:BSSignal:CHANnel:FFCH[?]`
	`<FFCH Channel>`

CDMA Power	*CDMA Power* allows you to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote Control	`CONFigure:BSSignal:POWer:CDMA[?]`
	`PROCedure:BSSignal:POWer:CDMA[?]`
	`<CDMA Power>`

Output Power	*Output Power* displays the total output power. The total Output Power level includes the AWGN power level.
Remote Control	`CONFigure:BSSignal:POWer:OUTput?`
Sync Level	*Sync Level* allows you to set the signal level of the sync channel in the forward CDMA channel.
Remote Control	`CONFigure:BSSignal:LEVel:FSYNc[?]` `<FSYNC Level>`
Pilot Level	*Pilot Level* allows you to set the Pilot Channel level in the forward CDMA channel.
Remote Control	`CONFigure:BSSignal:LEVel:FPICh[?]` `<FPICH Level>`
OCNS Level	*OCNS* turns the Orthogonal Channel Noise Simulator ON or OFF. Setting this to ON ensures a defined Output Power level.
Remote Control	`CONFigure:BSSignal:LEVel:OCNS:ENABle[?]` `ON | OFF`

Impairments

AWGN Level	*AWGN Level* turns on or off the Additive White Gaussian Noise generator and sets the level for modulation. This provides noise to more closely simulate actual operating conditions. ***Note:*** *The total output power of the CMU is the sum of the Forward CDMA signal plus the AWGN signal. The CMU automatically limits the AWGN signal level so that the maximum possible total output power of the CMU's RF connector is not exceeded.*
Remote Control	`CONFigure:IMPairments:LEVel:AWGN[?]` `<AWGN Level>`
Carrier Frequency Offset	*Carrier Frequency Offset* adjusts the carrier frequency of the Base Station. This setting is disabled if the RF Frequency is adjusted away from a standard RF Channel frequency.
Remote Control	`CONFigure:IMPairments:FOFFset[:RF][?]` `<Freq. Offset>`

FCH

FCH	*FCH* selects the Fundamental Channel to use in the forward CDMA channel. The channel selection range is dependent on the current setting of the Forward Radio Configuration.

Remote Control	`CONFigure:BSSignal:CHANnel:FFCH[?]`
	`PROCedure:BSSignal:CHANnel:FFCH[?]`
	`<FFCH Channel>`

FCH QOF

FCH QOF selects the Quasi-orthogonal Function that the Forward Fundamental Channel uses in the forward CDMA channel.

FCH Level

F-FCH Level adjusts the signal level of the Fundamental Channel in the forward CDMA channel.

Remote Control

```
CONFigure:BSSignal:LEVel:FFCH[?]
PROCedure:BSSignal:LEVel:FFCH[?]
<FFCH Level>
```

FCH Frame Offset

F-FCH Frame Offset sets the frame offset in the forward fundamental channel. Changing the frame offset immediately changes the traffic channel timing.

Remote Control

```
CONFigure:BSSignal:FROFfset:FFCH[?]
PROCedure:BSSignal:FROFfset:FFCH[?]
<Frame Offs>
```

Paging

Paging Level

Paging Level adjusts the signal level of the paging channel in the forward CDMA channel relative to the total output power.

Remote Control

```
CONFigure:BSSignal:LEVel:FPCH[?]
PROCedure:BSSignal:LEVel:FPCH[?]
<FPCH Level>
```

Base Station Properties

PN Offset

PN Offset sets the offset of the PN sequence. Changing the PN offset changes the timing of the pilot channel, the timing and contents of the sync channel message, and the long code mask of the paging channel.

Remote Control

```
CONFigure:BSSignal:PROPerty:PNOFfset[?]
PROCedure:BSSignal:PROPerty:PNOFfset[?]
<PN Offs>
```

Network Parameters (Connection Control – Network)

The popup menu *Network* displays the current network settings to match that of the mobile station under test. Use the EXP/CMP key to expand or compress the list.

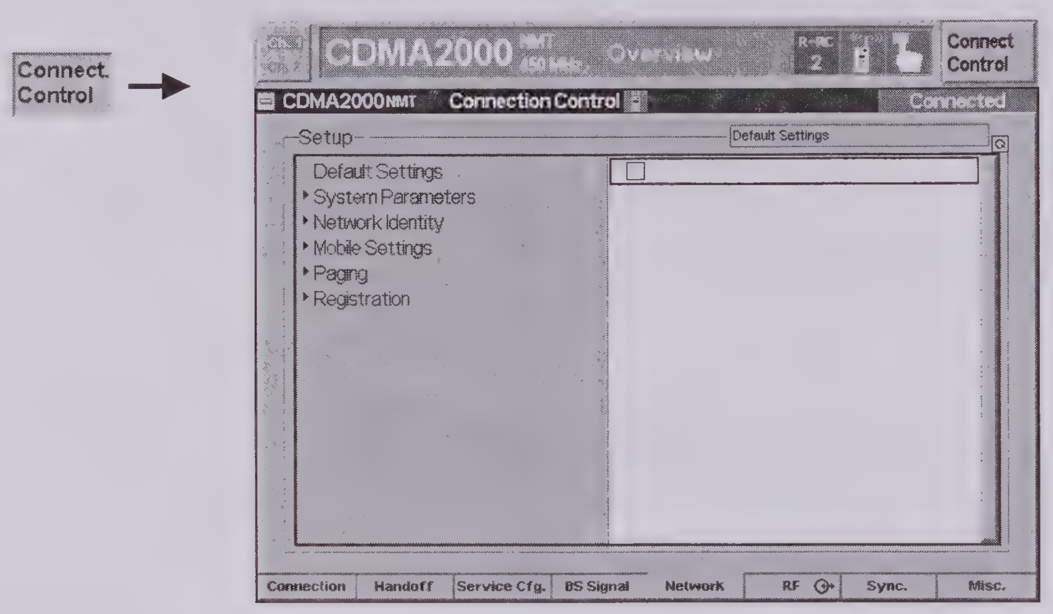

Connect. Control
CDMA2000
Overview
R-RC
2
Connect Control
CDMA2000NMT
Connection Control
Connected
Setup
Default Settings
Default Settings
System Parameters
Network Identity
Mobile Settings
Paging
Registration
Connection
Handoff
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

Figure 4-57: Connection Control – Network Parameters

Default Settings	The *Default Settings* switch overwrites all settings in the *Network* tab with default values.
System Parameters	
System IDNumber	*SID* is the System Identification.
Remote Control	`CONFigure:NETWork:SYSTem:SID[?]` *`<System ID Number>`*
Protocol Revision	*Protocol Revision* sets the preferred version of the protocol for the CMU to use.
Remote Control	`CONFigure:NETWork:SYSTem:PREVision[?]` *`<Protocol Revision>`*
Min. Protocol Revision	*Min. Protocol Revision* sets the minimum protocol revision capability of the mobile station.
Remote Control	`CONFigure:NETWork:SYSTem:MPRevision[?]` *`<Minimum Protocol Revision>`*
Base Station ID	*Base Station ID* sets the base station identification.
Remote Control	`CONFigure:NETWork:SYSTem:BSID[?]` *`<Base Station ID Number>`*

IMSI_11_12

IMSI_11_12 defines an ASCII string containing two digits representing the 11th and 12th digits of the IMSI of the base station.

Remote Control

`CONFigure:NETWork:SYSTem:IMSI:ETWelve[?]`
`<IMSI 11 12>`

Use Wildcard

Use Wildcard indicates whether to use special values for MCC and IMSI_11_12 that indicate to the mobile that it needs to use only IMSI_S.

Remote Control

`CONFigure:NETWork:SYSTem:UWCard[?]`
`ON | OFF`

Network Identity

Network IDNumber

NID is the Network Identification.

Remote Control

`CONFigure:NETWork:IDENtity:NID[?]`
`<Network ID Number>`

Mobile Country Code

Mobile Country Code is the MCC of the network.

Remote Control

`CONFigure:NETWork:IDENtity:MCC[?]`
`<Mobile Country Code_Network>`

Mobile Settings

Mobile Country Code

Mobile Country Code is the MCC of the mobile station.

Remote Control

`CONFigure:MSSInfo:MCC[?]`
`<Mobile Country Code>`

Mobile ID(MIN/IMSI)

Mobile ID (MIN/IMSI) allows you to enter the MIN or IMSI (mobile ID) of the mobile station. You are not required to provide this information. However, entering the mobile ID provides the tester with the necessary information so that you can use the *CALL MOBILE* softkey without waiting for registration. This number is retained from the last entered value or the last mobile station to register with the tester.

For some protocol revisions, you can choose either a MIN or an IMSI mobile ID. For other protocol revisions, a choice of mobile ID is not available.

***Note:** The CMU requires either a MIN or an IMSI mobile identification type.*

Remote Control

`CONFigure:MSSInfo:ID[?]`
`<Mobile ID (MIN/IMSI>`

Paging

Paging Channel Rate

Paging Channel Rate sets the paging rate of the base station's paging channel.

Remote Control

```
CONFigure:NETWork:PCHannel:RATE
R4K8 | R9K6
```

Paging Channel Slot Cycle Index

Paging Channel Slot Cycle Index determines the length of the slot cycle by setting the number of slots in the slot cycle.

Each slot cycle equals 1.28 seconds. The number of slots in the slot cycle is determined by the formula:

Slot cycle = 1.28×2^i (where i equals the slot cycle index)

For example:	$i = 0$	Slot cycle = 1.28 seconds
	$i = 1$	Slot cycle = 2.56 seconds
	$i = 2$	Slot cycle = 5.12 seconds

The paging channel is monitored during the slot cycle when operating in the slotted mode. A mobile stations slot occurs once per slot cycle

Remote Control

```
CONFigure:NETWork:PCHannel:SCINdex[?]
<Paging CH Slot Cycle Index>
```

Max. Slot Cycle Index

Max. Slot Cycle Index sets the maximum slot cycle index allowed to determine the slot cycle length.

Remote Control

```
CONFigure:NETWork:PCHannel:MSCindex[?]
<Max Slot Cycle Index>
```

Registration

Timer Based

Timer Based Registration sets the interval that the mobile station is to use to register with the tester. You can set a range of values from 12 seconds to approximately 2 minutes.

If set to OFF, the mobile station discontinues periodic registration with the tester.

Home

Home enables the home (non-roaming) registration mode.

Remote Control

```
CONFigure:NETWork:REGistration:HOME[?]
ON | OFF
```

Foreign SID

Foreign SID enables the SID registration mode.

Remote Control

```
CONFigure:NETWork:REGistration:FSID[?]
ON | OFF
```

Foreign NID

Foreign NID enables the network ID registration mode.

Remote Control

```
CONFigure:NETWork:REGistration:FNID[?]
ON | OFF
```

Power Up	*Power Up* enables the power-up registration mode.
Remote Control	`CONFigure:NETWork:REGistration:PUP[?]` `ON | OFF`
Power Down	*Power Down* enables the power-down registration mode.
Remote Control	`CONFigure:NETWork:REGistration:PDOWn[?]` `ON | OFF`
Parameter Reg.	This commands enables the parameter registration mode, causing re-registration after a parameter change.
Remote Control	`CONFigure:NETWork:REGistration:PARameter[?]` `ON | OFF`

RF Connectors (Connection Control – RF ⊖)

The popup menu *RF* ⊖ selects the connectors for RF signals. This includes defining the following.

- The RF input and output of the CMU (*RF Output*, *RF Input*).
- External attenuation at the connectors (*Ext. Att. Output*, *Ext. Att. Input*).

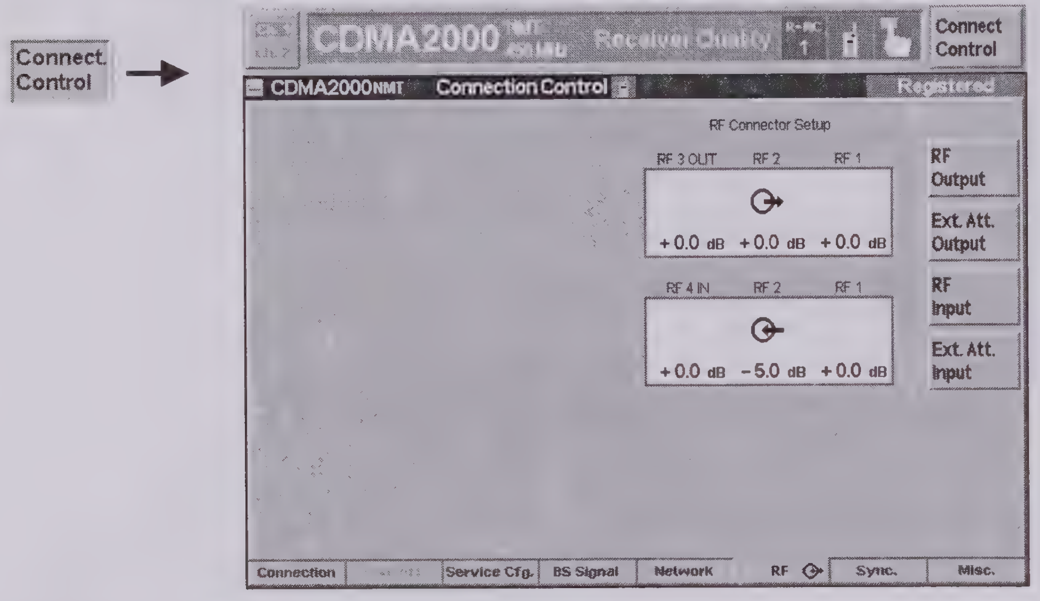

Connect. Control
CDMA2000
Receiver Quality
Connect Control
CDMA2000NMT
Connection Control
Registered
RF Connector Setup
RF 3 OUT
RF 2
RF 1
+0.0 dB
+0.0 dB
+0.0 dB
RF 4 IN
RF 2
RF 1
+0.0 dB
-5.0 dB
+0.0 dB
RF Output
Ext. Att. Output
RF Input
Ext. Att. Input
Connection
Service Cfg.
BS Signal
Network
RF ⊖
Sync.
Misc.

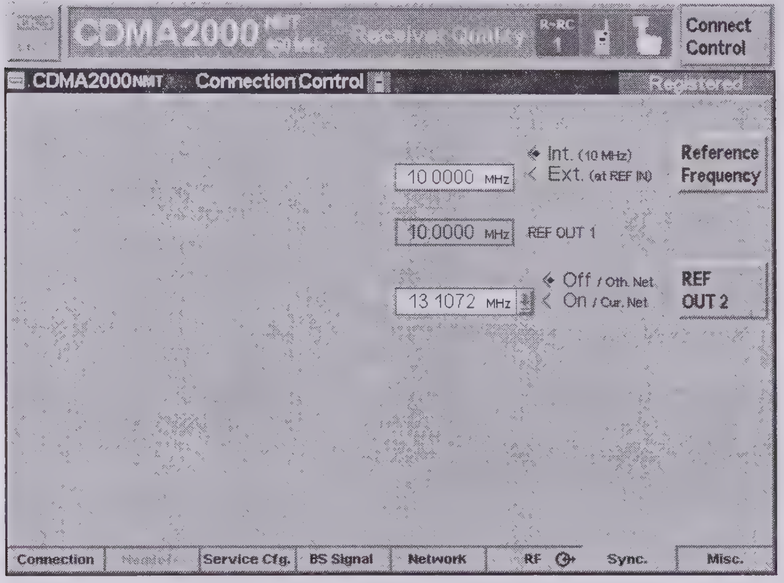
Figure 4-58: Connection Control – RF Connectors

The functions of this menu are described in the CDMA Non-Signalling section titled *RF Connectors (Connection Control – RF ⊖)*.

Reference Frequency (Connection Control – Sync.)

The popup menu *Sync.* defines the reference signals for synchronization. This includes:

- The internal or external Reference Frequency
- The output mode for the network-specific system clock (REF OUT 2)


CDMA2000
Receiver Quality
R-RC 1
Connect Control
CDMA2000 NMT Connection Control
Registered
Reference Frequency
REF OUT 2
Connection
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

◆ Int. (10 MHz)
‹ Ext. (at REF IN) 10.0000 MHz

10.0000 MHz REF OUT 1

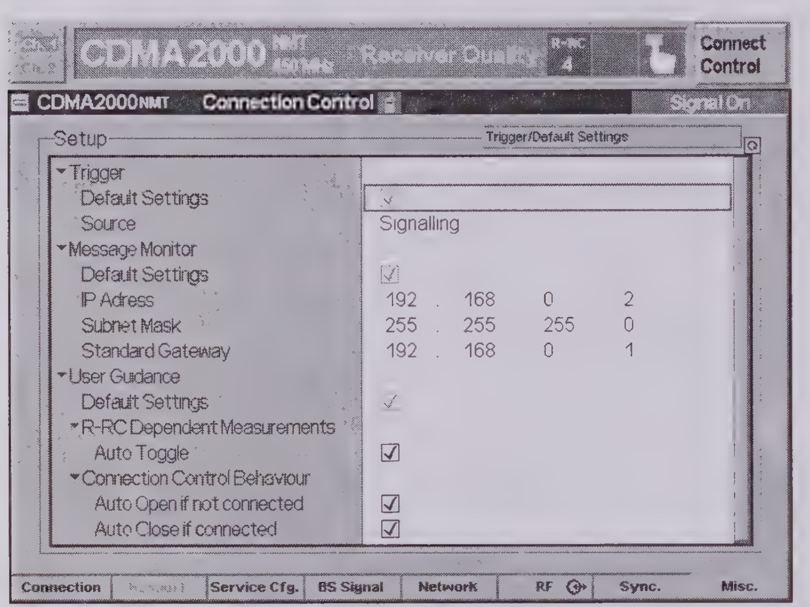
◆ Off / Oth. Net
‹ On / Cur. Net 13.1072 MHz

Figure 4-59: Connection Control – Synchronization

The functions of this menu are described in the CDMA Non-Signalling section titled *Reference Frequency (Connection Control – Sync.)*.

Miscellaneous User Settings (Connection Control – Misc.)

The popup menu *Misc.* defines the trigger source and miscellaneous user settings.


CDMA2000 NMT 450 MHz
Receiver Quality
R-RC 4
Connect Control
CDMA2000NMT
Connection Control
Signal On
Setup
Trigger/Default Settings
Connection
Service Cfg.
BS Signal
Network
RF
Sync.
Misc.

Trigger	
Default Settings	✓
Source	Signalling
Message Monitor	
Default Settings	☑
IP Adress	192 . 168 0 2
Subnet Mask	255 . 255 255 0
Standard Gateway	192 . 168 0 1
User Guidance	
Default Settings	✓
R-RC Dependent Measurements	
Auto Toggle	☑
Connection Control Behaviour	
Auto Open if not connected	☑
Auto Close if connected	☑

Trigger

Default Settings	The *Default Settings* switch returns the *Trigger* settings to their default values.
Source	*Source* defines the trigger source to be used. *Signalling* uses the trigger signal from the signalling unit of the CMU. *External* requires a trigger source supplied via the AUX 3 connector on the front panel.

AUX 3 pin assignments

Output trigger signals

Pin 2:	Sync Frame	26.67 ms
Pin 3:	PP2S	2 s
Pin 4:	Super Frame	80 ms
Pin 5:	Paging Frame	20 ms

Input trigger

- Pin 8: Trigger Input

Message Monitor

IP Address	IP address of the CMU.
Subnet Mask	Subnet Mask address of the CMU.
Standard Gateway	Gateway address of the CMU.

User Guidance

Default Settings	The *Default Settings* switch returns the*User Guidance* settings to their default values.
R-RC Dependent Measurements	
Auto Toggle	*Auto Toggle* (if checked) automatically selects the correct measurement modulation scheme (O-QPSK or HPSK) dependant on the Reverse Radio Configuration.
Connection Control Behavior	
Auto Open if not connected	*Auto Open if not connected* (if checked) causes the CMU to go directly to the Connection Control screen when a signalling function group is selected since a connection to a mobile station is necessary for the signalling measurements.
Auto Close if connected	*Auto Close if connected* (if checked) causes the CMU close the Connection Control screen as soon as a connection to a mobile station is established.

Marker Control

Markers are references available with any application displaying a graph of the measurement. This section gives a detailed explanation of how to control each marker type. Marker information specific to an application is located with the application.

Marker

The *Marker* softkey positions up to three markers and a D-line in the test diagram and reads their values.

Markers	Graphical tools for marking points on the measurement curve and for numerical output of measured values. The markers are turn activated by pressing the hotkey and pressing the *ON/OFF* key, or entering a value. Values can be entered directly with the keypad or with the *Variation* knob. The coordinates of the three markers are indicated in the format *Ordinate value (level)/abscissa value (time)* in a parameter line above the test diagram. The position of the reference marker is expressed in absolute units (level in dBm or percentage and time in symbols). The delta markers are expressed as absolute or relative values (relative position from the reference marker).
D-Line	The D-Line is a horizontal line that can be positioned to mark and read out an arbitrary level in the test diagram.

Ref R

The *Ref* R hotkey displays the status (On | Off) of the reference marker. Pressing the hotkey displays a popup menu to switch the reference marker on or off (use the *ON/OFF* key or the *Variation* knob).

The reference marker is represented by the symbol R in the test diagram. The marker position (abscissa) is determined in the input field *Ref. Marker*. The marker can be positioned to arbitrary time values. If its position is outside the diagram area it will be invisible and its coordinates will be "- - - / <abscissa_value>". The marker is switched off in the default setting *(OFF)*. The marker level is defined by the measurement curve at the marker position.

Delta 1

The *Delta* 1 hotkey displays the status (On | Off) of delta marker 1. Pressing the hotkey displays a popup menu to switch the delta marker 1 on or off (use the *ON/OFF* key or the *Variation* knob).

Delta marker 1 is represented by the symbol 1 in the test diagram. The marker position (abscissa) is defined in the input field *Delta Marker 1*. The marker can be positioned to arbitrary time values. If its position is outside the diagram area it will be invisible and its coordinates will be "<abscissa_value> / - - -". The marker is switched off in the default setting *(Off)*. The marker level is defined by the trace at the marker position.

Pressing the hotkey twice displays the *Delta 1 Config* popup display. It defines whether the position of delta marker 1 is measured and indicated in absolute units (of the horizontal scale) or relative to the reference marker.

Delta 2

The *Delta* 2 hotkey switches the delta marker 2 on or off (use the *ON/OFF* key).

The functions and control are identical to delta marker 1.

D-Line

The *D-Line* hotkey activates and controls the position of the D-Line in the test diagram.

The D-line is a horizontal, colored auxiliary line in the test diagram used for marking a level value and for measuring level differences.

Press the hotkey once to turn the D-Line on or off (using the *ON/OFF* key). The level of the D-line is determined by entering an absolute or relative value with either the keypad or *Variation* knob.

Press the hotkey twice to open the *D-Line Config* popup to set the absolute or relative D-Line display.

In the Absolute setting, the D-Line is expressed in the vertical scale units and is limited to the value range of the vertical scale. In the Relative setting, the D-Line value is relative to the maximum vertical scale.

The default setting is Off.

Contents

5 Remote Control – Basics 5.1

Structure and Order of Commands 5.1

Measurement Control 5.3

Measurement Groups 5.3

Measurement Statistics 5.3

Specifying Limits 5.5

Status Reporting System 5.5

Special Terms and Notation 5.7

5 Remote Control – Basics

This chapter gives a survey of the basic features and concepts of CDMA2000 remote control commands. Remote control can be described in terms analogous to the ones used in Chapter 3 for the classification of menus and settings for the graphical user interface. In the following, we will particularly point out the similarities and differences between manual and remote control.

Structure and Order of Commands

Chapter 6 of this manual gives a description of all CDMA2000 remote control commands, including their parameters, default values and ranges of all numerical parameters.

Function groups and test modes

Commands for the various CDMA-MS function groups are largely identical, however, the ranges of numerical values and some default settings may differ. All differences are explicitly quoted for each function group.

Commands for the two modes *Signalling* and *Non-Signalling* are listed separately although many of them have the same syntax.

Addressing

The CMU200 uses extended addressing. The instrument is assigned a primary address while each function group and test mode is identified via a secondary address. This allows the same remote commands to be used in several function groups and modes:

```
ibwrt(h_CDMA_Cell_MS_SIG, "INITiate:POWer")
ibwrt(h_CDMA_PCS_MS_SIG, "INITiate:POWer")
ibwrt(h_CDMA_PCS_MS_NSIG, "INITiate:POWer")
```

provided that the variables `h_CDMA_Cell_MS_SIG, etc.` have been appropriately defined, see program examples in Chapter 7 of the CMU Operating manual.

The remote control commands for first `(SYST:COMM:GPIB:ADDR)` and secondary `(SYST:REM:ADDR:SEC)` addressing are described in the CMU Operating manual.

Order of commands The commands are arranged to form groups belonging to the same measurement or to the same type of configurations. These command groups are identified by the second-level keyword (as in `POWer`). Applications belonging to a measurement group (see Chapter 5 of the CMU200 operating manual) are identified by the third-level keyword of each command (as in `MODulation: EVMagnitude`). Chapter 6 is organized as follows:

CDMA2000 Non-Signalling:

General configurations (second-level keywords `NSTandard, LEVEL, INTernal, EXTernal, RFANalyzer, RFGenerator, INPut, OUTPut, CORRection:LOSS, DM:CLOCk`)

Measurement groups: `MODulation`

CDMA2000 Signalling:

General configurations and signalling (`NSTandard, LEVel, INTernal, SIGNalling, HANDoff, BSSignal, NETWork, INPut, OUTPut, CORRection:LOSS, DM:CLOCk`).

Measurement groups: (second/third-level keywords `MSSinfo, SAPPower, OVERview:POWer, OVERview:MODulation, OVERview:CQUality, POWer:OLTResponse, POWer:MIOutput, POWer:MAOutput, POWer:GOUTput, MODulation:OVERview, MODulation: EVMagnitude, MODulation:PERRor, MODulation:MERRor, RXQuality:FER`).

The structure of Chapter 6 differs from Chapter 4 *(Functions and their Application)* where the measurements are presented first and configurations pertaining to the whole function group and test mode are reported at the end of each section.

The menu of the graphical user interface corresponding to a group of commands is quoted at the beginning of each section. Alphabetical lists of all commands are annexed to Chapter 6.

SCPI Conformity In view of the particular requirements of CDMA measurements not all commands could be taken from the SCPI standard. However, the syntax and structure of all commands is based on SCPI conventions. For a detailed description of the SCPI standard refer to Chapter 5 of the operating manual for the CMU basic unit.

SPCI confirmed and SPCI approved commands are explicitly marked in Chapter 6.

Remote Control All commands may be used for control of the CMU via the GPIB interface or serial (RS-232) interface.

Measurement Control

The commands in the measurement groups *Power*, *Modulation,* and *Receiver Quality* have an analogous structure and syntax. The measurements are controlled according to common concepts which are explained in detail in Chapter 5 of the CMU operating manual. The following sections show how the general concepts are applied to CDMA measurements.

Measurement Groups

The measurement groups are referred to as *measurement objects* (keyword <meas_obj>) in remote control. For CDMA measurements, the following measurement objects are defined:

Table 5-1: Measurement objects in the Signalling and Non-Signalling Mode

Non Signalling	Signalling
MODulation... Waveform quality, Frequency Error, Transmit Time Error, Carrier Feedthrough, and I/Q Imbalance statistical results and the results of the limit check can be evaluated.	**POWer...** Power as a function of time including statistical evaluations and the results of the limit check.
	MODulation... Phase error of the waveform interval as a function of time. The frequency error, average and RMS phase error, statistical results and the results of the limit check can be evaluated.
	RXQuality:FER Frame error rate test with limit check.

The measurement objects in Table 5-1 are complemented by groups of commands used to retrieve results that are automatically provided by the mobile station (e.g. the receiver parameters reported by the mobile phone). These command groups do not represent real measurement objects; they consist of queries only and are called pseudo measurement objects. For an overview, see the list of remote control commands at the end of Chapter 6.

Measurement Statistics

Together with the *Statistic Count*, the *Repetition Mode* defines how many evaluation periods are measured if the measurement is not stopped explicitly (measurement control commands `STOP...`, `ABORT...`) or by a limit failure. With remote control, the two repetition modes *Single Shot and Continuous* are available.

Generally four different traces are determined within one measurement:

- The result in the current period
- The maximum result
- The minimum result
- The average result (evaluated over a set number of waveform intervals)

The four results can be queried independently.

Table 5-2: Repetition mode in remote control

Setting	Description	Command
Statistic Count	Integer number of evaluation periods forming one statistics cycle. An evaluation period is equal to a burst `(POWer | MODulation)` or a frame (`RXQuality`). In an RXQuality:FER measurement, the STATistics parameter denotes the number of frames to be averaged per iteration step (search cycle).	CONFigure:<meas_obj>:CONTrol:STATistics **1 ... 1000 | NONE** (<meas_obj> = OVERview:CQUality | POWer... | MODulation...) CONFigure:RXQuality:FER:TSETup<nr>:CONTrol: STATistics **1 ... 20000**
Repetition Mode		
Single Shot	The measurement is stopped after one statistics cycle.	CONFigure:<meas_obj>:CONTrol:REPetition **SINGleshot**, <StopCondition>, <Stepmode> (<meas_obj> = OVERview... | POWer... | MODulation...| RXQuality:FER:TSETup<nr>)
Continuous	The measurement is continued until stopped explicitly or by a limit failure. Average results are calculated according to the rules described in chapter 3.	CONFigure:<meas_obj>:CONTrol:REPetition **CONTinuous**, <StopCondition>, <Stepmode> (<meas_obj> = OVERview... | POWer... | MODulation...| RXQuality:FER:TSETup<nr>)
Counting	Repeated single shot measurement with configured statistics cycles.	CONFigure:<meas_obj>:CONTrol:REPetition **1 ... 1000**, <StopCondition>, <Stepmode> (<meas_obj> = POVERview... | POWer... | MODulation...| RXQuality:FER:TSETup<nr>) A counting measurement with 1 evaluation period is equivalent to a single shot measurement..
Traces	The specifiers `CURRent, MMAX`, and `AVERage` denote the traces for the current evaluation period, the extreme value, and the average of a set of evaluation periods. They correspond to the *Display Mode* set in the measurement configuration menus. In general all four traces are evaluated during the measurement. They are selected via the specifiers used as last keywords in the `READ...`, `FETCh...` or `SAMPle...` queries.	Measurement results: READ:ARRay:<meas_obj>:<disp>? READ:SUBarrays:<meas_obj>:<disp>? ... <disp> = CURRent | AVERage | MMAX <meas_obj> = POWer:TIME | MODulation:DEViation Limit matching: CALCULATE[:SCALar]:<meas_obj>:<disp>: MATChing:LIMit? <Response> .... <Response> contains the limit matching identifiers for all three traces

Specifying Limits

The following table gives an overview of the types of limits and possible results of the limit check.

Table 5-3: Limits and limit check

Type	Description	Command
Scalar limits	Limit values for a single (scalar) measured quantity. Depending on the measured quantity, either an upper limit or upper and lower limits can be defined.	CONFigure:<meas_obj>:<disp>:LIMit [:SCALar]:<symmetry>:<Spec.>:VALue <disp> = CURRent | AVERage | MMAX | CAMMax where CAMMax denotes a limit valid for all measurement curves (current and average and min/maximum) <meas_obj> = OVERview... | POWer... | MODulation... <symmetry> = SYMMetric | ASYMmetric for symmetric or asymmetric upper and lower limits <Spec.> = UPPer | LOWer | [:COMBined] for upper limits, lower limits, or combined upper and lower limits. CONFigure:RXQuality:FER:TSETup<nr>:LIMit[:SCALar]:SYMmetric[:COMBined]:VALue
Limit lines	For Gated Output Power, a tolerance template consisting of several areas can be defined.	CONFigure:POWer:GOUTput:CAMMax:LIMit :LINE:SYMMetric[:COMBined] <Limit_line_param.> <Limit_line_param.> represents a set of numbers pinning down the power template .
Limit check	All scalar limits belonging to the same measurement group are read out together with the command on the right side.	CALCulate:<meas_obj.>:MATChing:LIMit?
	Possible results of the scalar limit check are listed on the right side.	`NMAU` not matching, underflow `NMAL` not matching, overflow `INV` measured value invalid `OK` no limit failure

Status Reporting System

A general description of SCPI status registers and of the status reporting system is given in Chapter 5 of the CMU operating manual. This section is devoted to the particular features concerning CDMA measurements.

The CMU offers 30 independent STATus:OPERation:SUM1|2:CMU<nr> sub-registers (<nr>=1 ... 15) which are implemented in hierarchical form. The bits of the 30 STATus:OPERation registers are set only after the registers are assigned to a function group and measurement mode.

In the CONDition part, the STATus:OPERation register contains information on which actions the instrument is being executing or, in the EVENt part, information on which actions the instrument has executed since the last readout. All fife parts of the registers can be read using one of the commands of the subsystem `STATus:OPERation:SUM1|2:CMU<nr>:...`

CDMA mobile tests comprise the two signalling modes *Non-Signalling* and *Signalling* for the CDMA2000 function groups so that a total of 2 secondary addresses are used. In the two status registers for the *Non-Signalling* mode the bit assignment is as follows:

Table 5-4: Non-Signalling bits used in the STAT:OPER:SUM1|2:CMU<nr> sub-registers

Bit-No.	Description	Symbol in `STAT:OPER:SYMB...`
6	**Reference Frequency not synchronized** This bit is set if the reference frequency is not synchronized.	RFNS

In the two status registers for the *Signalling* mode the bit assignment is as follows:

Table 5-5: Signalling bits used in the STAT:OPER:SUM1|2:CMU<nr> sub-registers

Bit-No.	Description	Symbol in `STAT:OPER:SYMB...`
0	**Call from Mobile** This bit is set when the CMU receives a call from the mobile under test.	CFM
1	**Release from Mobile** This bit is set when the connection to the mobile is being released.	RFM
2	**Loss of Radio Link** This bit is set if the CMU had to leave the signalling state "Connected" (because of a low signal etc.).	LORL
3	**Mobile Registered** This bit is set when a registration was successfully performed.	MREG
6	**Reference Frequency not synchronized** This bit is set if the reference frequency is not synchronized.	RFNS
7	**Mobile Deregistered** This bit is set if the CMU had to leave the signalling state "Registered" (because of a low signal etc.).	MDER
9	**Traffic Channel Active** This bit is set when voice data is transmitted via the analog voice channel.	TCH
11	**RF Input overdriven** This bit is set if one of the three RF input connectors is overdriven.	RFIO

Bit-No.	Description	Symbol in `STAT:OPER:SYMB...`
12	**RF Input underdriven** This bit is set if one of the three RF input connectors is underdriven.	**RFIU**

Special Terms and Notation

Below we list some particular features in the syntax of the CDMA commands. The general description of the SCPI command syntax can be found in Chapter 5 of the CMU Operating manual, section *"Structure and Syntax of Device Messages"*.

Description of commands

The commands are arranged in tables; all of them are described along the same scheme. From top to bottom, the table rows contain the following entries:

1. Complete command syntax including the parameter list and a short description of the command
2. List and description of the parameters with their default values, the default units and unit rings
3. Detailed description of the command, signalling state required for command execution (in Signalling mode), required firmware version

Detailed lists of default values are annexed to the command description.

Order of commands

The commands are arranged according to their function. The general purpose of a command is described by the keyword in the second level. Lower-level keywords define the command in more detail. This means that commands with the same second-level, third-level etc. keywords are generally grouped together in the same sections.

Example: `CONFigure:POWer:MAOutput:CONTrol:STATistics <Statistics>`

Commands with the keyword *POWer* in the second level belong to the power measurement. The keywords in the third, fourth and fifth level indicate that the command defines the number of bursts forming a statistics cycle in the measurement of the MS maximum output power.

Measurement object

The term *measurement object* denotes a group of remote control commands relating to the same group of measured quantities. E.g., all commands concerning the measurement of the signal power form a common measurement object.

A pseudo-measurement object concerns quantities which do not actually have to be measured because they are automatically obtained during the signalling process (e.g. the receiver parameters reported by the mobile phone).

Combined measurements

To limit the number of remote control command and their parameters scalar quantities of the same measurement object are always measured together and output in lists.

To limit the number of remote control commands, scalar results are always measured together and output in lists. Arrays (e.g. the traces for `POWer` and `MODulation` measurements) are output as lists of values separated by commas; it is possible to retrieve either the whole list (see commands `READ:ARRay`... etc.) or the values located in a number of subranges that are part of the total measurement range (see commands `READ:SUBarrays`...; the subarrays are defined via `CONFigure:SUBarrays`...).

Parameters

Many commands are supplemented by a parameter or a list of parameters. Parameters either provide alternative options (setting a or setting b or setting c ..., see special character "|"), or they form a list separated by commas (setting x,y).

<Par_Name> Alternative settings are described by a common name (literal) written in angle brackets (<>). This literal serves as a description of the parameters only; in an application program it must be replaced by one of the settings given in the detailed parameter description.

Example: CONFigure:POWer:MAOutput:CONTrol:STATistics <Statistics>

with <Statistics> = 1 ... 1000 | NONE

possible command syntax: `CONF:POW:MAO:CONT:STAT NONE`

NAN NAN (not a number) is generally used to represent missing data, e.g. if a portion of a trace has not been acquired yet. It is also returned after invalid mathematical operations such as division by zero. As defined in the SCPI standard, NAN is represented as 9.91 E 37.

INV INV (invalid) is returned if a limit check is performed without defining the appropriate tolerance values.

Upper / lower case

Upper/lower case characters characterize the long and short form of the keywords in a command. The short form consists of all upper-case characters, the long form of all upper case plus all lower case characters. Either the short form or the long form are allowed; mixed forms are not generally recognized. The instrument itself does not distinguish upper case and lower case characters.

Special characters

| A vertical stroke in the parameter list characterizes alternative parameter settings. Only one of the parameters separated by | must be selected.

Example: The following command has two alternative settings:

```
DEFault:LEVel ON | OFF
```

[ ] *Key words* in square brackets can be omitted when composing the command header (see Chapter 5 of the CMU Operating manual, section "Structure of a Command"). The complete command must be recognized by the instrument for reasons of compatibility with the SCPI standard.

Parameters in square brackets are optional as well. They may be entered in the command or omitted.

{ } Braces or curly brackets enclose one or more parameters that may be included zero or more times.

<nr> This symbol stands for a numeric suffix, e.g. an enumeration index for input and output connectors.

List of Commands

Command: The *Command* column of the table contains all remote control commands arranged according to their function (configurations or measurement objects). Within a section, the commands are listed by alphabetical order.

Parameters: The *Parameter* column lists the parameters of the commands.

Remarks: The *Remarks* column gives additional information about the commands which

- Have no query form (no query)
- Have only a query form (query only)
- Can be used both as setting commands and as queries (with query, this applies to all commands belonging to one of the two preceding categories)

Alphabetical Lists The end of Chapter 6 includes an alphabetical command list for both test modes.

Contents

6 Remote Control – Commands 6.1

CDMA Module Tests (Non-Signalling) 6.1

Global Settings 6.1

Connection Control 6.3

Subsystem RFANalyzer (Analyzed Input Signals) 6.3

Generator Object "RFGenerator" – Generator Control 6.4

Subsystem for Input and Output (External Attenuation at the Connectors) 6.9

Subsystem DM:CLOCk (Synchronization) 6.10

Test Object NPOWer 6.11

Control of measurement – Subsystem NPOWer 6.11

Measured Values – Subsystem NPOWer 6.13

Test Object MODulation 6.14

Control of Measurement – Subsystem MODulation 6.14

Test Configuration 6.16

Measured Values – Subsystem MODulation 6.21

CDMA Mobile Tests (Signalling Mode) 6.22

Network Standards – Subsystem NETWork 6.22

Connection Control 6.23

Signalling – Subsystem SIGNalling (Call Setup and Cleardown) 6.23

Subsystem Mobile Information 6.24

Subsystem Service Configuration 6.26

Subsystem BSSignal... (Signal of Base Station/CMU) 6.34

Subsystem HANDoff:TARGet (Handoff Target) 6.39

Subsystem NETWork:IDENtity 6.40

Test Object NPOWer 6.46

Control of measurement – Subsystem NPOWer 6.46

Measured Values – Subsystem NPOWer 6.49

Subsystems INPut, OUTPut, CORRection (External Attenuation at the Connectors) 6.50

Subsystem DM:CLOCk (Synchronization) 6.51

Test Object OVERview 6.52

General Configurations – Subsystem OVERview:MCQuality (O-QPSK and H-PSK) 6.52

General Configurations – Subsystem OVERview:PPOWer 6.54

Overview Measurement Control – Subsystem OVERview:OVERview 6.56

Test Configuration 6.60

Measured Values – Subsystem OVERview:OVERview 6.63

Overview Measurement Control – Subsystem OVERview:CQUality 6.64

Test Configuration 6.66

Measured Values – Subsystem OVERview:CQUality 6.67

Test Object POWer:MIOutput 6.68

Control of measurement – Subsystem POWer:MIOutput 6.68

Test Configuration 6.71

  - Measured Values – Subsystem POWer:MIOutput 6.74
- Test Object POWer:MAOutput 6.76
  - Control of measurement – Subsystem POWer:MAOutput 6.76
  - Test Configuration 6.79
  - Measured Values – Subsystem POWer 6.82
- Test Object POWer:GOUTput 6.84
  - Control of measurement – Subsystem POWer:GOUTput 6.84
  - Test Configuration 6.87
  - Measured Values – Subsystem POWer:GOUTput 6.90
- Test Object CDPower 6.93
  - Control of measurement – Subsystem CDPower:CDPW 6.96
  - Measured Values – Subsystem CDPower:CDPW 6.101
- Test Object CDPower:PCDep 6.104
  - Control of measurement – Subsystem CDPower:PCDep 6.104
  - Measured Values – Subsystem CDPower:PCDep 6.108
- Test Object CDPower:CHPW 6.112
  - Control of measurement – Subsystem CDPower:CHPW 6.112
  - Measured Values – Subsystem CDPower:CHPW 6.117
- Test Object MODulation:OVERview 6.120
  - Control of Measurement – Subsystem MODulation:OVERview 6.120
  - Test Configuration 6.121
  - Measured Values – Subsystem MODulation:OVERview 6.130
- Test Object MODulation:EVMagnitude 6.132
  - Control of Measurement – Subsystem MODulation:EVMagnitude 6.132
  - Test Configuration 6.134
  - Measured Values – Subsystem MODulation:EVMagnitude 6.137
- Test Object MODulation:PERRor 6.141
  - Control of Measurement – Subsystem MODulation:PERRor 6.141
  - Test Configuration 6.142
  - Measured Values – Subsystem MODulation:PERRor 6.146
- Test Object MODulation:MERRor 6.150
  - Control of Measurement – Subsystem MODulation:MERRor 6.150
  - Measured Values – Subsystem MODulation:MERRor 6.155
- Test Object Receiver Quality 6.159
  - Test Object RXQuality:FER (Frame Erasure Rate) 6.159
  - General Configurations – Subsystem RXQuality:FER: FSSCommon:CONTrol 6.162

List of Non-Signalling Commands 6.166

6 Remote Control – Commands

This chapter contains all remote-control commands for the CDMA function groups. The commands are presented in tabular form with their parameters and the ranges of values. The structure of this chapter is analogous to that of the reference part for manual operation (Chapter 4).

The measurement test modes *Non-Signalling* and *Signalling* are presented separately. Within the each measurement mode, the general configurations are presented first and then the individual measurement groups (test objects) are presented.

Measurement groups that are identical in both test modes *(`POWer, MODulation...`)* are presented in a separate section between the two test modes.

General notes on remote control in the CDMA function group can be found in Chapter 5. An introduction to remote control according to SCPI standard and the status registers of the CMU is given in Chapter 5 of the operating manual for the CMU basic instrument.

> ***Note:*** *Remote control commands that can also be used as a query are indicated with [?] at the end of the command. As a query, the "?" (question mark) must be part of the command.*

CDMA Module Tests (Non-Signalling)

In the *Non-Signalling* mode, an RF test signal can be generated and an RF signal with CDMA characteristics is analyzed. No signalling parameters are transferred.

Global Settings

The remote-control commands presented in this section configure settings affecting the entire Non-Signalling function group providing settings valid for the entire function group.

[SENSe:]LEVel:MODE[?] ***<RF Level Mode>***				RF Level Mode
<RF Level Mode>	Description of parameters	Def. value	Def. unit	Unit ring
AUTO | MANual	Maximum input level mode for RF	MAN	–	
Description of command				FW vers.
This command defines the maximum expected input level mode.				V3.05 or Above

[SENSe:]LEVel:MAXimum[?] Max. RF Level

<RF Manual Max Level>

<RF Manual Max Level>	Description of parameters	Def. value	Def. unit	Unit ring
–43 dBm to + 44 dBm	Maximum input level for RF 1	0.0	dBm	
–57 dBm to + 30 dBm	Maximum input level for RF 2	0.0	dBm	
–80 dBm to +9 dBm	Maximum input level for RF 4 IN	0.0	dBm	

Description of command	FW vers.
This command defines the maximum expected input level. The value range depends on the RF input used and the external attenuation set (see `[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]` command).	V3.05 or Above

TRIGger[:SEQuence]:SOURce[:OQPSk][?]
TRIGger[:SEQuence]:SOURce:HPSK[?]
TRIGger[:SEQuence]:SOURce:QPSK[?] Trigger Source

<Source>

<Source>	Description of parameters	Def. Value	Def. unit	Unit ring
INTernal |	Trigger source from internal clock	FRUN	–	
EXTernal |	External Trigger source supplied	(EXT for		
FRUN	Trigger set to free run (OQPSK and QPSK)	HPSK)		

Description of command

FW vers.

V3.05 or Above

This command sets the source of the trigger signal.

The external trigger source is supplied via the AUX 3 connector on the front panel. The AUX 3 pin assignments are:

Output Signals

• Pin 2:	Sync Frame	26.67 ms
• Pin 3:	PP2S	2 s
• Pin 4:	Super Frame	80 ms
• Pin 5:	Paging Frame	20 ms

Input Signal

• Pin 8:	Trigger Input

The trigger setting affects the results of the Transmit Time Error measurement as described here.

Trigger Freerun (O-PSK)	No timing error results are possible.
Trigger Internal (O-PSK and HPSK)	Timing error results are possible when DUT is correctly synchronised with the CMU.
Trigger External (O-PSK and HPSK)	Timing error results are possible if an external trigger signal is provided and the DUT is correctly synced with the CMU.

Transmit Time Error measurement is not available for QPSK.

Connection Control

The remote-control commands presented in this section determine the RF analyzer settings and the signals generated by the CMU, the inputs and outputs used as and the reference frequency. They correspond to the settings in the popup menu of the softkey *Connect Control*, located at the top right of each main menu.

Subsystem RFANalyzer (Analyzed Input Signals)

The subsystem *RFANalyzer* specifies which type of RF signals can be analyzed. It corresponds to the tab *Analyzer* in the popup menu *Connection Control*.

[SENSe:]RFANalyzer:FREQuency:UNIT[?] **<Analyzer Freq. Unit>**				Frequency Unit
<Analyzer Freq. Unit>	Description of parameters	Def. Value	Def. unit	Unit ring
Hz | KHz | MHz | GHz | CH	Frequency unit or Channel Number	Hz	Hz	
Description of command				FW vers.
This command defines whether the frequency of the RF signal analyzed is specified in frequency units or as a CDMA channel number. Frequency units must be used to select input signals that are outside the designated channel range.				V3.05 or Above

[SENSe:]RFANalyzer:FREQuency[?] ***<Frequency>***				RF Frequency
<Frequency>	Description of parameters	Def. Value	Def. unit	Unit ring
0.200 000 MHz to 2 700 . 000 000 MHz	Input frequency Default Input Frequency for following standards:		Hz	
	450 MHz, BC 5	450.60 MHz CH 12		
	Cellular, BC0/BC2/BC3/BC7/BC9/BC10	833.49 MHz CH 283		
	PCS – BC1/BC4/BC8	1857.50 MHz CH 150		
	IMT2000 – BC6	1920.60 MHz CH 12		
Description of command				FW vers.
This command defines the frequency of the RF signal analyzed. With the command `[SENSe:]RFANalyzer:FREQuency:UNIT`, the default frequency unit can be changed, and even CDMA channel numbers can be entered instead of frequencies. In the latter case, the assignment of channel numbers and frequencies meets the specification for the reverse channel (signal direction from mobile to CMU). BC = Band Class.				V3.05 or Above

[SENSe:]RFANalyzer:FOFFset[?] ***<Analyzer Freq. Offset>***				Frequency Offset
<Analyzer Freq. Offset>	Description of parameters	Def. value	Def. unit	Unit ring
–50.0 kHz to +50.0 kHz | ON | OFF	Frequency offset setting Frequency offset on No frequency offset	OFF	Hz	
Description of command				FW vers.
This command determines a frequency offset to the RF signal analyzed.				V3.05 or Above

Generator Object "RFGenerator" – Generator Control

The subsystem *RFGenerator* configures the RF signals generated by the CMU. It corresponds to the tab *Generator* in the popup menu *Connection Control*.

INITiate:RFGenerator **ABORt:RFGenerator**	Start RF generator, reserve resources Switch off RF generator, release resources	⇒ *RUN* ⇒ *OFF*
Description of command		FW vers.
These commands have no query form. They start and stop the RF generator, setting it to the status indicated in the top right column.		V3.05 or Above

FETCh:RFGenerator:STATus?				Generator Status
Returned values	Description of parameters	Def. Value	Def. unit	Unit ring
OFF | RUN | ERR	Generator switched off (`ABORt` or `*RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	
Description of command				FW vers.
This command is always a query. It returns the current generator status.				V3.05 or Above

Generator Settings – Subsystem RFGenerator

The subsystem *RFGenerator* configures all settings for the generated RF signal. It corresponds to the tab *Generator* in the popup menu *Connection Control*.

SOURce:RFGenerator:LEVel:OCNS:VALue?				OCNS Value
Returned value	Description of parameters	Def. value	Def. unit	Unit ring
OCNS	OCNS level relative to CDMA power	–	dB	
Description of command				FW vers.
This command is always a query. It returns the OCNS level in units relative to the CDMA power (see `SOURce:RFGenerator:LEVel` command).				V3.05 or Above

SOURce:RFGenerator:LEVel:OCNS:ENABle[?] OCNS Enable
<OCNS Enable>

<OCNS Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	OCNS generator on or off	ON	–	

Description of command	FW vers.
This command turns the Orthogonal Channel Noise Simulator on or off. In the ON setting, the OCNS level is such that the sum of all generator levels and the OCNS level equals the nominal base station power. The query returns the OCNS level in units relative to the CDMA power (see `SOURce:RFGenerator:LEVel` command).	V3.05 or Above

SOURce:RFGenerator:FREQuency[:RF]:UNIT[?] Frequency Unit
<Unit>

<Unit>	Description of parameters	Def. Value	Def. unit	Unit ring
Hz | KHZ | MHZ | GHZ | CH	Frequency unit or Channel Number	Hz	Hz	

Description of command	FW vers.
This command defines whether the frequency of the RF signal generated is specified in frequency units or as an CDMA channel number. Frequency units must be used to select input signals that are outside the designated CDMA channel range.	V3.05 or Above

SOURce:RFGenerator:FREQuency[:RF][?] RF Frequency
<Frequency>

<Frequency>	Description of parameters	Def. Value	Def. unit	Unit ring
0.200 000 MHz to 2 700 . 000 000 MHz	Input frequency Default Input Frequency for following standards:		Hz	
	450 MHz, BC 5	460.60 MHz CH 25		
	Cellular, BC0/BC2/BC3/BC7/BC9/BC10	878.49 MHz CH 283		
	PCS – BC1/BC4/BC8	1937.50 MHz CH 150		
	IMT2000 – BC6	2110.60 MHz CH 12		

Description of command	FW vers.
This command defines the frequency of the RF signal generated. With the command `SOURce:RFGenerator:FREQuency:UNIT`, the default frequency unit can be changed, and even CDMA channel numbers can be entered instead of frequencies. In the latter case, the assignment of channel numbers and frequencies meets the specification for the forward channel (signal direction from CMU to mobile under test).	V3.05 or Above

SOURce:RFGenerator:CHANnel:FFCH[?] Traffic Channel
<FFCH Channel>

<FFCH Channel>	Description of parameters	Def. Value	Def. unit	Unit ring
2 to 63	Traffic channel number	8	–	

Description of command	FW vers.
This command determines the number of the forward fundamental traffic channel generated by the CMU.	V3.05 or Above

SOURce:RFGenerator:PROPerty:PNOFfset[?] PN Offset
<PN Offset>

<PN Offset>	Description of parameters	Def. value	Def. unit	Unit ring
0 to +511	PN offset	0	–	

Description of command	FW vers.
Describes an offset for the timing of the pilot channel, the sync channel message, and the long code mask of the paging channel.	V3.05 or Above

SOURce:RFGenerator:FROFfset:FFCH[?] Frame Offset
<Frame Offs>

<Frame Offs>	Description of parameters	Def. value	Def. unit	Unit ring
0 to +15	Frame offset	0	–	

Description of command	FW vers.
This command defines an offset for the forward fundamental traffic channel timing in CDMA frames.	V3.05 or Above

SOURce:RFGenerator:FRATe:FFCH[?] Frame Rate
<Frame Rate>

<Frame Rate>	Description of parameters	Def. value	Def. unit	Unit ring
EIGHth |	Frames at 1/8 of the rate set	FULL	–	
QUARter |	Frames at 1/4 of the rate set			
HALF |	Frames at 1/2 of the rate set			
FULL |	Frames at the full rate set			
DEF	Sets the value to the default setting			

Description of command	FW vers.
This command sets the frame rate for the forward fundamental traffic channel.	V3.05 or Above

SOURce:RFGenerator:MODulation:MODe[?] Modulation Mode
<Modulation Mode>

<Modulation Mode>	Description of parameters	Def. value	Def. unit	Unit ring
AUTO |	CDMA2000 signal according to channel configuration	AUTO	–	
OFF |	Empty carrier signal (Continuous Wave)			
DEF	Sets the value to the default setting			

Description of command	FW vers.
This command selects the method used to modulate the generated RF signal.	V3.05 or Above

SOURce:RFGenerator:POWer:CDMA[?] *<CDMA Power>*				CDMA Power
<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to 7.0 dBm	RF1 OUT, 0 dB ext. atten. RF2 OUT, 0 dB ext. atten. RF3 OUT, 0 dB ext. atten	–70.0	dBm	
Description of command				FW vers.
This command determines total CDMA output power (absolute value, in dBm). CDMA Power value range depends on the RF input used and the external attenuation set.				V3.05 or Above

SOURce:RFGenerator:POWer:OUTput? *<Output Power>*				Output Power
Returned value	Description of parameters	Def. value	Def. unit	Unit ring
Output Power	Total output power	NAN	dB	
Description of command				FW vers.
This command is always a query. It returns the total output power of the CMU, i.e. the CDMA power plus the AWGN level.				V3.05 or Above

SOURce:RFGenerator:LEVel:FFCH[?] *<FFCH Level>*				FFCH Level
<FFCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–7 dB to –20 dB |	Forward fundamental channel level	–14	dB	
MIN |	Sets the value to the range minimum			
MAX |	Sets the value to the range maximum			
DEF |	Sets the value to the default setting			
ON |	Forward fundamental channel on			
OFF	Forward fundamental channel off			
Description of command				FW vers.
This command sets the signal level of the fundamental channel of the forward CDMA channel and enables or disables the signal.				V3.05 or Above

SOURce:RFGenerator:LEVel:FSYNc[?] *<FSYNC Level>*				FSYNc Level
<FSYNC Level>	Description of parameters	Def. value	Def. unit	Unit ring
–7 dB to –20 dB |	Forward sync channel level	–16	dB	
MIN |	Sets the value to the range minimum			
MAX |	Sets the value to the range maximum			
DEF |	Sets the value to the default setting			
ON |	Forward sync channel on			
OFF	Forward sync channel off			
Description of command				FW vers.
This command sets the signal level of the sync channel of the forward CDMA channel and enables or disables the signal.				V3.05 or Above

SOURce:RFGenerator:LEVel:FPICh[?] FPICh Level
<FPICH Level>

<FPICH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–7 dB to –20 dB |	Forward pilot channel level	–7	dB	
MIN |	Sets the value to the range minimum			
MAX |	Sets the value to the range maximum			
DEF |	Sets the value to the default setting			
ON |	Forward pilot channel on			
OFF	Forward pilot channel off			

Description of command	FW vers.
This command sets the signal level of the pilot channel of the forward CDMA channel and enables or disables the signal.	V3.05 or Above

SOURce:RFGenerator:LEVel:FPCH[?] FPCH Level
<FPCH Level>

<FPCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–7 dB to –20 dB |	Forward paging channel level	–12	dB	
MIN |	Sets the value to the range minimum			
MAX |	Sets the value to the range maximum			
DEF |	Sets the value to the default setting			
ON |	Forward paging channel on			
OFF	Forward paging channel off			

Description of command	FW vers.
This command sets the signal level of the paging channel of the forward CDMA channel and enables or disables the signal.	V3.05 or Above

Generator Impairments – Subsystem IMPairments

The subsystem *IMPairments* configures the settings to impair the generated RF signal. It corresponds to the tab *Generator* in the popup menu *Connection Control*.

SOURce:IMPairments:LEVel:AWGN[?] AWGN Level
<AWGN Level>

<AWGN Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB |	AWGN level	OFF	dB	
MIN |	Sets the value to the range minimum			
MAX |	Sets the value to the range maximum			
DEF |	Sets the value to the default setting			
ON |	AWGN generator on			
OFF	AWGN generator off			

Description of command	FW vers.
This command determines an Additional White Gaussian Noise level to impair the RF generator signal.	V3.05 or Above

SOURce:IMPairments:FOFFset[:RF][?] RF Frequency Offset
<Freq. Offset>

<Freq. Offset>	Description of parameters	Def. value	Def. unit	Unit ring
–50.0 kHz to +50.0 kHz |	BS frequency offset setting	OFF	Hz	
MIN |	Sets the value to the range minimum			
MAX |	Sets the value to the range maximum			
DEF |	Sets the value to the default setting			
ON |	BS frequency offset on			
OFF	No frequency offset			

Description of command	FW vers.
This command defines an offset for the RF generator frequency set with the command `[SENSe:]RFGenerator:FREQuency <Number>`. The offset frequency must be in multiples of 1 Hz.	V3.05 or Above

Subsystem for Input and Output (External Attenuation at the Connectors)

The subsystem for input and output configures the input and output connectors. The subsystem corresponds to the tab *RF* ⊕ in the popup menu *Connect. Control*.

INPut[:STATe] RF Input
<State>

<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 |	Connector RF 1 used as input	RF2	–	
RF2 |	Connector RF 2 used as input			
RF4	Connector RF 4 IN used as input			

Description of command	FW vers.
This command determines the connector to be used for RF input signals. The bidirectional connectors RF 1 and RF 2 can be used both as input and output connectors in the same measurement (see `OUTPut[:STATe]`). Only one input and one output may be active at the same time, a new RF input setting supersedes the previous one.	V3.05 or Above

OUTPut[:STATe] RF Output
<State>

<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 |	Connector RF 1 used as output	RF2	–	
RF2 |	Connector RF 2 used as output			
RF3	Connector RF 3 OUT used as output			

Description of command	FW vers.
This command determines the connector to be used for RF output signals. The bidirectional connectors RF 1 and RF 2 can be used as input and output connectors in the same measurement (see `INPut[:STATe]`). Only one input and one output may be active at the same time, a new RF output setting supersedes the previous one.	V3.05 or Above

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]
<Attenuation>

Ext. Att. Input

<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +90 dB	Value for external attenuation at the input <nr>, where <nr> = 1, 2, 4	0.0	dB	

Description of command	FW vers.
This command assigns an external attenuation value to the inputs of the instrument *(RF 1, RF 2, RF 4 IN)*.	V3.05 or Above

[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude]
SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude]
<Attenuation>

Ext. Att. Output

<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +90 dB	Value for external attenuation at output <nr>, where <nr> = 1, 2, 3	0.0	dB	

Description of command	FW vers.
This command assigns an external attenuation value to the outputs of the instrument *(RF 1, RF 2, RF 3 OUT)*.	V3.05 or Above

Subsystem DM:CLOCk (Synchronization)

The subsystem *DM:CLOCk* sets a system clock specific to the network. This frequency is set in the tab *Synch.* in the popup menu *Connect. Control*.

SOURce:DM:CLOCk:STATe
<Mode>

REF OUT 2

<Mode>	Description of parameters	Def. Value	Def. unit	Unit ring
ON | OFF	Switch on/off system clock	OFF	–	

Description of command	FW vers.
This commands switches the system clock specific to the network at the *REF OUT 2* connector on or off. When set to on, the frequency is set at 13.1072 MHz.	V3.05 or Above

Test Object NPOWer

The subsystem *NPOWer* measures the Narrow Band Power using CDMA2000 receiver filters. Narrow Band Power is only availble via GPIB control. There is no corresponding measurement available from the function groups in the front panel menus.

Control of measurement – Subsystem NPOWer

The subsystem *NPOWer* controls the narrow band power measurement.

INITiate:NPOWer	Start new measurement	⇒ *RUN*
ABORt:NPOWer	Abort running measurement and switch off	⇒ *OFF*
STOP:NPOWer	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:NPOWer	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.	V3.05 or Above

CONFigure:NPOWer:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	V3.05 or Above

FETCh[:SCALar]:NPOWer:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	–
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	–
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	–
NONE	Statistic count set to off			

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	V3.05 or Above

Subsystem NPOWer:CONTrol

The subsystem *NPOWer:CONTrol* defines the repetition mode and statistic count of the measurement.

CONFigure:NPOWer:CONTrol[?] Scope of Measurement
<Statistics>, <Repetition>, <Stop Condition>, <Step Mode>

<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | MIN | MAX | DEF,	Number of bursts per statistics cycle Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 | CONT | SING | DEF,	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Condition>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SON,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)*	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | STEP	Continue measurement according to its rep. mode Interrupt measurement after each statistics cycle	NONE	–	

Description of command	FW-Vers.
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands	V3.05 or Above

CONFigure:NPOWer:CONTrol:STATistics[?] Statistic Count
<Statistics>

<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | MIN | MAX | DEF	Number of bursts per statistics cycle Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	100	–	

Description of command	FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.	V3.05 or Above

CONFigure:NPOWer:EPOWer[?] Expected Power
<Expected Power>

<Expected Power>	Description of parameters	Def. value	Def. unit	Unit ring
–100 dB to 10 dB | MIN | MAX | DEF	Expected power of the mobile station Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	–20	dB	

Description of command	FW-Vers.
This command sets the total expected power from the mobile station.	V3.05 or Above

CONFigure:NPOWer:CONTrol:REPetition[?] ***<Repetition>, <Stop Cond>, <Step Mode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONT |	Continuous measurement (until STOP or ABORT)			
SING |	Single shot measurement (until Status = RDY)			
DEF,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Default value			
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement according to its rep. mode	NONE	–	
STEP |	Interrupt measurement after each statistics cycle			
DEFault	Default value			
Description of command				FW vers.
This command determines the number of statistics cycles for the measurement. ***Note:** In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				V3.05 or Above

Measured Values – Subsystem NPOWer

The subsystem *NPOWer* determines and outputs the results of the Narrow Band Power measurements.

				Scalar results:
READ[:SCALar]:NPOWer?				Start single shot measurement and return results
FETCh[:SCALar]:NPOWer?				Read out measurement results (unsynchronized)
SAMPle[:SCALar]:NPOWer?				Read out measurement results (synchronized)
Returned values	Description	Def. value	Def. unit	Unit ring
Current Average Power,	For all measurements		dBm	
Current Min Power,			dBm	
Current Max Power,	Scalar values returned		dBm	
Average Average Power,			dBm	
Average Min Power,			dBm	
Average Max Power			dBm	
Description of command				FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results.				V3.05 or Above

Test Object MODulation

The subsystem *MODulation* measures general scalar modulation parameters. The subsystem corresponds the popup menu *Modulation Quality Configuration.*

Control of Measurement – Subsystem MODulation

The subsystem *MODulation* controls the modulation measurement. It corresponds to the softkey *Mod. Qual.* in the measurement menu *Analyzer/Generator.*

INITiate:MODulation:MQUality:OQPSk **INITiate:MODulation:MQUality:HPSK** **INITiate:MODulation:MQUality:QPSK**	Start new measurement	⇒ *RUN*
ABORt:MODulation:MQUality:OQPSk **ABORt:MODulation:MQUality:HPSK** **ABORt:MODulation:MQUality:QPSK**	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:MQUality:OQPSk **STOP:MODulation:MQUality:HPSK** **STOP:MODulation:MQUality:QPSK**	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:MQUality:OQPSk **CONTinue:MODulation:MQUality:HPSK** **CONTinue:MODulation:MQUality:QPSK**	Next measurement step (*stepping mode*)	⇒ *RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.		V3.05 or Above

CONFigure:MODulation:MQUality:OQPSk:EREPorting[?] **CONFigure:MODulation:MQUality:HPSK:EREPorting[?]** **CONFigure:MODulation:MQUality:QPSK:EREPorting[?]** ***<Report Mode>***				Event Reporting
<Report Mode>	Description of parameters	Def. Value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF | DEF	Service request Single operation complete SRQ and SOPC No reporting Sets the value to the default setting	OFF	–	–
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped (see Chapter 5 of the CMU 200 Operating manual about event reporting).				V3.05 or Above

FETCh[:SCALar]:MODulation:MQUality:OQPSk:STATus? **FETCh[:SCALar]:MODulation:MQUality:HPSK:STATus?** **FETCh[:SCALar]:MODulation:MQUality:QPSK:STATus?**		Measurement Status		
Returned values	Description of parameters	Def. Value	Def. unit	Unit ring
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	
Description of command				FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).				V3.05 or Above

CONFigure:MODulation:MQUality:PCBits[?] ***<Power Control Bits>***		Power Control Bits		
<Power Control Bits>	Description of parameters	Def. value	Def. unit	Unit ring
AUTO | HOLD | ADOW | AUP | RTES | OFF	Auto mode, closed-loop operation Alternating up/down control bits All power control bits down All power control bits up Range test mode Disable power control bits	AUTO	–	
Description of command				FW vers.
This command defines the power control bits in the RF generator signal.				V3.05 or Above

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the *Modulation Quality Configuration* menu.

Subsystem MODulation:MQUality:CONTrol

The subsystem *MODulation:MQUality:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Quality Configuration*.

DEFault:MODulation:MQUality:CONTrol[?]				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem OVERview:MODulation:CONTrol to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				V3.05 or Above

CONFigure:MODulation:MQUality:OQPSk:CONTrol[?] **CONFigure:MODulation:MQUality:HPSK:CONTrol[?]** **CONFigure:MODulation:MQUality:QPSK:CONTrol[?]** ***<Statistics>*, *<Repetition>*, *<Stop Cond>*, *<Step Mode>***				Scope of Measurement
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000,	Number of bursts within a statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 | CONT | SING | DEF,	Multiple measurement (counting, until Status = STEP | RDY)Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror | DEF,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | STEP | DEF	Continue measurement according to its rep. mode Interrupt measurement after each statistics cycle Sets the value to the default setting	NONE	–	
Description of command				FW vers.
This command sets all measurement control parameters. It combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands.				V3.05 or Above

CONFigure:MODulation:MQUality:OQPSk:CONTrol:STATistics[?]
CONFigure:MODulation:MQUality:HPSK:CONTrol:STATistics[?]
CONFigure:MODulation:MQUality:QPSK:CONTrol:STATistics[?]
<Statistics>

Statistic Count

<Statistics>	Description of parameters	Def. Value	Def. unit	Unit ring
1 to 1000	Number of bursts within a statistics cycle	100	–	

Description of command	FW vers.
This command selects the type of measured values and determines the number of bursts forming one statistics cycle.	V3.05 or Above

CONFigure:MODulation:MQUality:OQPSk:CONTrol:REPetition[?]
CONFigure:MODulation:MQUality:HPSK:CONTrol:REPetition[?]
CONFigure:MODulation:MQUality:QPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>

Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONT |	Continuous measurement (until STOP or ABORT)			
SING |	Single shot measurement (until Status = RDY)			
DEF,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEF,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement according to its rep. mode	NONE	–	
STEP |	Interrupt measurement after each statistics cycle			
DEF	Sets the value to the default setting			

Description of command	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. ***Note:****In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	V3.05 or Above

DEFault:MODulation:MQUality:OQPSk:CONTrol[?]
DEFault:MODulation:MQUality:HPSK:CONTrol[?]
DEFault:MODulation:MQUality:QPSK:CONTrol[?]
<Enable>

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the MODulation:MQUality:*:CONTrol subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	V3.05 or Above

CONFigure:MODulation:MQUality:OQPSk:CONTrol:SBANd:FOFFset[?]
CONFigure:MODulation:MQUality:HPSK:CONTrol:SBANd:FOFFset[?]
CONFigure:MODulation:MQUality:QPSK:CONTrol:SBANd:FOFFset[?]
<Sideband Freq. Offset>

Sideband Frequency Offset

<Sideband Freq. Offset>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 1.6 MHz |	Sideband frequency offset	900000	Hz	
DEF |	Sets the value to the default setting			
MIN |	Sets the value to the range minimum			
MAX |	Sets the value to the range maximum			
OFF	No sideband frequency offset			

Description of command	FW vers.
This command sets the frequency offset used for the sideband suppress power measurement.	V3.05 or Above

Tolerance values – Subsystem MODulation:LIMit

The subsystem *MODulation:LIMit* defines tolerance values for the modulation measurement. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Quality Configuration.*

CONFigure:MODulation:MQUality:OQPSk:CMMax:LIMit[?]
CONFigure:MODulation:MQUality:HPSK:CMMax:LIMit[?]
CONFigure:MODulation:MQUality:QPSK:CMMax:LIMit[?]
<Waveform Quality Limit>, <Carrier Freq. Limit>, <Transmit Time Error Limit>,
<Carrier Feedthrough Limit>, <Sideband Suppr. Limit>

Limits

<Waveform Quality Limit>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to 1.0 |	Lower limit for waveform quality	0.944	–	
OFF |	No waveform quality limit check			
ON,	Limit check on			
<Carrier Freq. Limit>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 1000 |	Upper limit for carrier frequency error	300	Hz	
OFF |	No carrier frequency error limit check			
ON,	Limit check on			
<Transmit Time Error Limit>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to 0.00001 |	Upper limit for transmit time error	0.000001	s	
OFF |	No transmit time error limit check			
ON,	Limit check on			
<Carrier Feedthrough Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–120 to –20 |	Upper limit for carrier feedthrough	–25	dB	
OFF |	No carrier feedthrough limit check			
ON,	Limit check on			
<RESERVED>	Description of parameters	Def. value	Def. unit	Unit ring
,	Reserved for future setting	–	–	
<Sideband Suppr. Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–120 to 10 |	Upper sideband suppres limit	–43	dB	
OFF |	No sideband suppres limit check			
ON	Limit check on			

Description of command	FW vers.
This command defines limits for *Current* and *Max/Min* quantities describing the modulation quality	V3.05 or Above

CONFigure:MODulation:MQUality:OQPSk:AVERage:LIMit[?]
CONFigure:MODulation:MQUality:HPSK:AVERage:LIMit[?]
CONFigure:MODulation:MQUality:QPSK:AVERage:LIMit[?]
<Waveform Quality Limit>, <Carrier Freq. Limit>, <Transmit Time Error Limit>,
<Carrier Feedthrough Limit>, <Sideband Suppr. Limit>

Limits

<Waveform Quality Limit>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to 1.0 | OFF | ON,	Limit for waveform quality No waveform quality limit check Limit check on	0.944	–	
<Carrier Freq. Limit>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 1000 | OFF | ON,	Upper limit for carrier frequency error No carrier frequency error limit check Limit check on	300	Hz	
<Transmit Time Error Limit>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to 0.00001 | OFF | ON,	Upper limit for transmit time error No transmit time error limit Limit check on	0.000001	s	
<Carrier Feedthrough Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–120 to –20 | OFF | ON,	Upper limit for carrier feedthrough No carrier feedthrough limit check Limit check on	–25	dB	
<RESERVED>	Description of parameters	Def. value	Def. unit	Unit ring
,	Reserved for future setting	–	–	
<Sideband Suppr. Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–120 to 10 | OFF | ON	Limit for sideband suppres No sideband suppres limit check Limit check on	–43	dB	

Description of command	FW vers.
This command defines limits for the *Average* quantities describing the modulation quality.	V3.05 or Above

DEFault:MODulation:MQUality:OQPSk:CMMax:LIMit[?]
DEFault:MODulation:MQUality:HPSK:CMMax:LIMit[?]
DEFault:MODulation:MQUality:QPSK:CMMax:LIMit[?]
<Enable>

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the MODulation:MQUality:*:LIMit subsystem to their default values (the setting OFF results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*. The keyword `CMMax` refers to the *Current* and *Max./Min.* limits.	V3.05 or Above

DEFault:MODulation:MQUality:OQPSk:AVERage:LIMit[?]
DEFault:MODulation:MQUality:HPSK:AVERage:LIMit[?]
DEFault:MODulation:MQUality:QPSK:AVERage:LIMit[?]
<Enable>

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the MODulation:MQUality:*:LIMit subsystem to their default values (the setting OFF results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).* The keyword `CMMax` refers to the *Current* and *Max./Min.* limits.	V3.05 or Above

DEFault:MODulation:MQUality:LIMit[?]
<Enable>

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	The parameters differ from the default values (partially or totally)			

Description of command	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem MODulation:LIMit to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	V3.05 or Above

Measured Values – Subsystem MODulation

The subsystem *MODulation* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation*.

READ[:SCALar]:MODulation:MQUality:OQPSk?
READ[:SCALar]:MODulation:MQUality:HPSK?
READ[:SCALar]:MODulation:MQUality:QPSK? Start single shot measurement and return results

FETCh[:SCALar]:MODulation:MQUality:OQPSk?
FETCh[:SCALar]:MODulation:MQUality:HPSK?
FETCh[:SCALar]:MODulation:MQUality:QPSK? Read out meas. results (unsynchronized)

SAMPle[:SCALar]:MODulation:MQUality:OQPSk?
SAMPle[:SCALar]:MODulation:MQUality:HPSK?
SAMPle[:SCALar]:MODulation:MQUality:QPSK? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
MS Power (x3),		NAN	dBm	
Waveform Quality (x3),	0.0 to +1.0	NAN	–	
Carrier Frequency Error (x3),	–10.0 Hz to 0.0 Hz	NAN	Hz	
Transmit Time Error (x3),		NAN	s	
Carrier Feedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
RESERVED				
Sideband Suppres Lower (x3),		NAN	dB	
Sideband Suppres Upper (x3),		NAN	dB	
Out of Tolerance (x3)	0% to 100 %	NAN	%	

Description of command	FW vers.
These commands are always queries. They start a modulation measurement and output all scalar measurement results (see Chapter 4). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.	V3.05 or Above

CALCulate[:SCALar]:MODulation:MQUality:OQPSk:MATChing:LIMIt? Limit Matching
CALCulate[:SCALar]:MODulation:MQUality:HPSK:MATChing:LIMIt?
CALCulate[:SCALar]:MODulation:MQUality:QPSK:MATChing:LIMIt?

<table>
<tr><th>Returned values</th><th>Value range</th><th>Def. value</th><th>Def. unit</th><th>Unit ring</th></tr>
<tr><td>Waveform Quality (x3),</td><td></td><td>INV</td><td>–</td><td></td></tr>
<tr><td>Carrier Frequency Error (x3),</td><td>For all measured values:</td><td>INV</td><td>Hz</td><td></td></tr>
<tr><td>Tansmit Time Error (x3),</td><td></td><td>INV</td><td>s</td><td></td></tr>
<tr><td>Carrier Feedthrough (x3),</td><td>NMAU | NMAL | INV | OK</td><td>INV</td><td>–dB</td><td></td></tr>
<tr><td>RESERVED,</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Lower Sideband Suppres (x3),</td><td></td><td>INV</td><td>dB</td><td></td></tr>
<tr><td>Upper Sideband Suppres (x3)</td><td></td><td>INV</td><td>dB</td><td></td></tr>
</table>

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.	V3.05 or Above

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

CDMA Mobile Tests (Signalling Mode)

In the *Signalling* mode, the CMU is able to generate control and traffic channel signals and to set up a call to the mobile. A broad range of signalling parameters can be configured and measurements may be performed with a call connection established.

> ***Note:*** *Remote control commands that can also be used as a query are indicated with [?] at the end of the command. As a query, the "?" (question mark) must be part of the command.*

Network Standards – Subsystem NETWork

The *NETWork* system switches between the different CDMA network standards.

CONFigure:NETWork:STANdard[?] *<Standard>*				Network Standard
<Standard>	Description of parameters	Def. value	Def. unit	Unit ring
CDMA2000 450 MHz				
N45T |	N45T, Band Class 5	NMT-450	–	
CDMA2000 Cellular				
USC | KCEL | TACS | JTAC | NA7C | NA9C | NA8S |	US Cellular, Band Class 0 Korean Cellular, Band Class 0 TACS, Band Class 2 JTACS, Band Class 3 North American 700 MHz, Band Class 7 North American 900 MHz, Band Class 9 Secondary 800 MHz, Band Class 10	USC	–	
CDMA2000 PCS				
NAPC | KPCS | B18M |	North American PCS, Band Class 1 Korean PCS, Band Class 4 1800 MHz, Band Class 8	NAPC	–	
CDMA2000 IMT-2000				
IM2K	IMT-2000, Band Class 6	IM2K	–	
Description of command			Sig. State	FW vers.
This command activates the test mode according to one of the provided CDMA network standards.			All	V3.05 or Above

Connection Control

The remote-control commands presented in this section control the signalling (call setup and release, services, signalling parameters), determine the inputs and outputs as well as the reference frequency. They correspond to the settings in the popup menu of the softkey *Connect Control* located at the top right of each main menu.

> ***Note:*** *Some parameters of the CMU assume several independent values: The default value is used to set up a call; most default values can be modified in the signalling states Signal Off, Signal On and Registered. The current value during the call (signalling states Connected) can still be changed, however, modifying this current value does not alter the default value. The handoff value comes into effect after a handoff from another to the current network; most handoff values can be set in all signalling states.*
>
> *Many of the default and current parameters in CDMA2000-MS occur in the SIGNalling and in the BSSignal subsystems.*
>
> *Default values are set with a* `CONFigure ...` *command, current values are set with the corresponding* `PROCedure ...` *command.*

Signalling – Subsystem SIGNalling (Call Setup and Cleardown)

The subsystem *SIGNalling* controls the call setup and cleardown from the CMU to the mobile and determines the signalling parameters. It corresponds to the tab *Connection* (for different signalling states, see command `PROCedure:SIGNalling:ACTion`) in the popup menu *Connection Control.*

PROCedure:SIGNalling:ACTion ***<Signalling Action>***				Signalling Control
<Signalling Action>	Description of parameters	Def. value	Def. unit	Unit ring
SOFF | SON | UNRegister CTMobile | CRELease | HANDoff	Switch off RF signal *(signal off)* Switch on RF signal *(signal on)* Unregister the mobile Call to mobile Call release Handoff	SOFF	–	–
Description of command			Sig. State	FW vers.
This command has no query form and no default value. It changes between the different signalling states of the CMU.			See below	V3.05 or Above

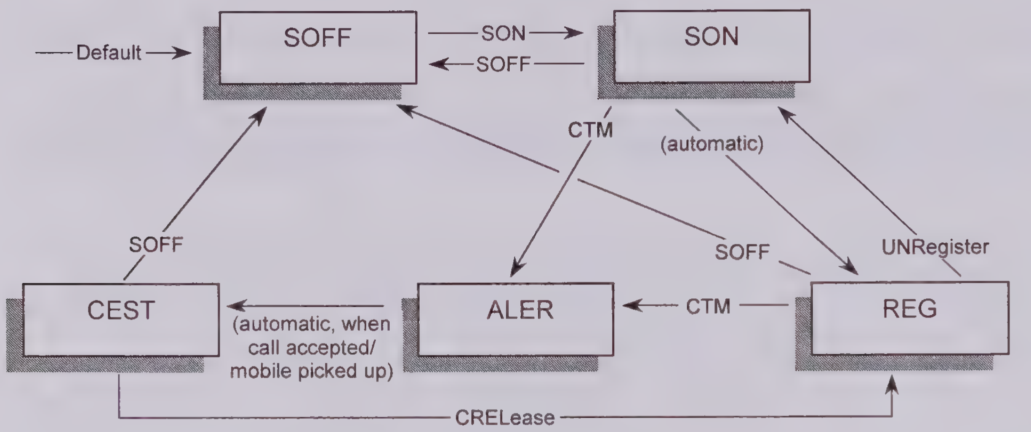


Fig. 6-1: Signalling states of the CMU and transitions

Signalling states:

See description of command [SENSe:]SIGNalling:STATe?

Actions (initiated from the CMU):

See description of command [PROCedure:]SIGNalling:ACTion

Further transitions between the signalling states (not shown in Fig. 6-1) may occur, e.g. in case of errors. For the transitions and signalling states related to handoff procedures (CDMA to AMPS) refer to the AMPS-MS operating manual.

[SENSe:]SIGNalling:STATe?				Signalling State
Returns	Description of parameters	Def. value	Def. unit	Unit ring
SOFF | SON | REG | ALER | CEST |	RF signal switched off *(Signal Off)* RF signal switched on *(Signal On)* MS registration performed *(Registered)* Mobile is ringing *(Alerting)* Call to mobile set up *(Call Established)*	SOFF	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the current signalling state.			All	V3.05 or Above

Subsystem Mobile Information

The subsystem *MSSinfo* queries the mobile station for its properties. The subsystem corresponds to the *MS Information* in the *Connection* tab of the *Connection Control* menu. The mobile phone properties do not actually represent measured values, they are provided by the mobile phone during registration.

Note: *If no mobile is connected, or if the mobile under test is not synchronized (signalling states SOFF, SON), the queries in this section will return the default values INV. The Mobile ID and serial number are available in the REG and CEST states. The remaining information is available in the CEST state only and are overwritten by INV if registration is lost (transition from REG or CEST to SON or SOFF).*

[SENSe:]MSSinfo?				Mobile Information
Returns	Description of parameters	Def. value	Def. unit	Unit ring
Protocol revision of the mobile station,	1 to 6	NAN	–	–
Mobile Country Code,	0 to 999	NAN	–	–
National Mobile Station Identification,	34-bit MIN (mobile identification number) or 50-bit IMSI	NAN	–	–
ESN of the mobile station,	Electronic Serial number of the mobile station	NAN	–	–
Max. EIRP	Maximum Effective Isotropic Radiated Power	NAN	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the mobile station information.			All	V3.05 or Above

[SENSe:]MSSinfo:PREVision?				Mobile Information
Returns	Description of parameters	Def. value	Def. unit	Unit ring
Protocol revision of the mobile station	1 to 6	NAN	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the protocol revision supported by the mobile station.			All	V3.05 or Above

[SENSe:]MSSinfo:BCLSupport?				Mobile Information
Returns	Description of parameters	Def. value	Def. unit	Unit ring
Band Class Support	Returns the supported mobile station band class in the form: (0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1) to indicate not supported (0) or supported (1) for band classes 0 through 10.	NAN	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the band class supported by the mobile station.			All	V3.05 or Above

[SENSe:]MSSinfo:SCLSupport?				Mobile Information
Returns	Description of parameters	Def. value	Def. unit	Unit ring
Sub Band Class Support	Returns the supported mobile station subband class in the form: (0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1) to indicate not supported (0) or supported (1) for subband classes 0 through 7.	NAN	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the sub-band class supported by the mobile station.			All	V3.05 or Above

[SENSe:]MSSinfo:TERMinal?				Mobile Information
Returns	Description of parameters	Def. value	Def. unit	Unit ring
Manufacturer Code,	Mobile station manufacturer code number	–	–	–
Model Number,	Mobile station model number	–	–	–
Firmware Revision,	Mobile station firmware revision	–	–	–
Local Control,	NSUP | SUPP Local control not supported or supported	–		
Reported Service Options	Mobile station service option	–	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the mobile station's information.			All	V3.05 or Above

Subsystem Service Configuration

The subsystem SCONfig configures the service configuration to use when establishing a call to the mobile. It corresponds to the *Connection* and *Service Cfg.* tabs in the popup menu *Connection Control.*

CONFigure:SCONfig:SCLass[n]:SERVice[?] **PROCedure:SCONfig:SCLass[n]:SERVice[?]** ***<Service(n)>***				Service
<Service(n)>	Description of parameters	Def. value	Def. unit	Unit ring
LOOP | SPEech	Loopback service Speech service	SPE	–	
Description of command			Sig. State	FW vers.
This command configures the service type to use to establish a call to the mobile. The Loopback mode must be used for receiver quality measurements. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.			See Descript.	V3.05 or Above

Subsytem SCONfig:SCLass:LOOP

The subsystem SCONfig:SCLass:LOOP defines the service options for the Loopback service type.

CONFigure:SCONfig:SCLass<nr>:LOOP:SOPTion[?] **PROCedure:SCONfig:SCLass<nr>:LOOP:SOPTion[?]** ***<Loopback Service Current Sel>***				Loopback Service
<Loopback Service Current Sel>	Description of parameters	Def. value	Def. unit	Unit ring
S02D | S09D	Service Option 2 Service Option 9	S02D	–	
Description of command			Sig. State	FW vers.
This command determines the service option to use when establishing a call in the loop-back service mode. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.			See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:LOOP:S02D:FCH? **PROCedure:SCONfig:SCLass<nr>:LOOP:S02D:FCH?**				Radio Configuration
Returned value	Description of parameters	Def. Value	Def. Unit	Unit ring
Forward Radio Configuration,	1 to 4	1	–	
Forward Multiplex Option,	1 to 4	1	–	
Reverse Radio Configuration,	1 to 3	1	–	
Reverse Multiplex Option	1 to 3	1	–	
Description of command			Sig. State	FW vers.
This command is always a query. It returns the radio configuration and the multiplex option of the forward and reverse fundamental traffic channel for service option 2. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.			See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH? **PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH?**				Radio Configuration
Returned value	Description of parameters	Def. value	Def. unit	Unit ring
Forward Radio Configuration,	2 to 5	2	–	
Forward Multiplex Option,	2 to 5	2	–	
Reverse Radio Configuration,	2 to 4	2	–	
Reverse Multiplex Option	2 to 4	2	–	
Description of command			Sig. State	FW vers.
This command is always a query. It returns the radio configuration and the multiplex option of the forward and reverse fundamental traffic channel for service option 9. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.			See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:RC[?] **PROCedure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:RC[?]** *<F_RC>*, *<R_RC>*				Radio Configuration
<F_RC>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 4 | MINimum | MAXimum | DEFault,	Forward radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	
<R_RC>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 3 | MINimum | MAXimum | DEFault	Reverse radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	
Description of command			Sig. State	FW vers.
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option 2. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.			See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:RC[?] Radio Configuration
PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:RC[?]
<F_RC>, <R_RC>

<F_RC>	Description of parameters	Def. value	Def. unit	Unit ring
2 to 5 | MINimum | MAXimum | DEFault,	Forward radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	2	–	
<R_RC>	Description of parameters	Def. value	Def. unit	Unit ring
2 to 4 | MINimum | MAXimum | DEFault	Reverse radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	2	–	

Description of command	Sig. State	FW vers.
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option 9. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:FRAT[?] Frame Rate
PROCedure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:FRAT[?]
<Frame Rate>

<Frame Rate>	Description of parameters	Def. Value	Def. Unit	Unit ring
EIGHth | QUARter | HALF | FULL | DEFault	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set Frame rate set to default	FULL	–	

Description of command	Sig. State	FW vers.
This command sets the frame rate for a traffic channel for test calls using service option 2. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:FRAT[?] Frame Rate
PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:FRAT[?]
<Frame Rate>

<Frame Rate>	Description of parameters	Def. Value	Def. Unit	Unit ring
EIGHth | QUARter | HALF | FULL | DEFault	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set Frame rate set to default	FULL	–	

Description of command	Sig. State	FW vers.
This command sets the frame rate for a traffic channel for test calls using service option 9. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:PGEN[?] Pattern Generation
PROCedure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:PGEN[?]
<Pattern Generation>

<Pattern Generation>	Description of parameters	Def. Value	Def. Unit	Unit ring
RANDom | FIXed | DEFault	Random Fixed	RAND	–	

Description of command	Sig. State	FW vers.
This command sets the pattern generation for service option 2 to either a random or fixed pattern. If this command is set to FIXed, pattern sent to the mobile station is defined with the command `CONFigure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:PATTern[?]`. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:PGEN[?] Pattern Generation
PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:PGEN[?]
<Pattern Generation>

<Pattern Generation>	Description of parameters	Def. Value	Def. Unit	Unit ring
RANDom | FIXed | DEFault	Random Fixed	RAND	–	

Description of command	Sig. State	FW vers.
This command sets the pattern generation for service option 9 to either a random or fixed pattern. If this command is set to FIXed, pattern sent to the mobile station is defined with the command `CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:PATTern[?]`. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:PATTern[?] Pattern
PROCedure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:PATTern[?]
<Pattern>

<Pattern>	Description of parameters	Def. Value	Def. Unit	Unit ring
{Hex value} | DEFault	Hex values for pattern generator	A5A5A5A5 A5A5A5A5	–	

Description of command	Sig. State	FW vers.
This command defines the pattern used by the pattern generator for service option 2. This pattern is used when the Pattern Generation is set to FIXed. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:PATTern[?]
PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:PATTern[?]
<Pattern>

Pattern

<Pattern>	Description of parameters	Def. Value	Def. Unit	Unit ring
{Hex value} | DEFault	Hex values for pattern generator	A5A5A5A5 A5A5A5A5	–	

Description of command	Sig. State	FW vers.
This command defines the pattern used by the pattern generator for service option 9. This pattern is used when the Pattern Generation is set to FIXed. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

Subsytem SCONfig:SCLass:SPEech

The subsystem SCONfig:SCLass:SPEech defines the service options for the Speech service type.

CONFigure:SCONfig:SCLass<nr>:SPEech:SOPTion[?]
PROCedure:SCONfig:SCLass<nr>:SPEech:SOPTion[?]
<Speech Service Current Sel>

Speech Service

<Speech Service Current Sel>	Description of parameters	Def. value	Def. unit	Unit ring
S01D | S03D | S17D | SX8T	Service Option 1 Service Option 3 Service Option 17 Service Option 0X8000	S01D	–	

Description of command	Sig. State	FW vers.
This command determines the service option to use when establishing a call in the speech mode. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:SPEech:S01D:FCH?
PROCedure:SCONfig:SCLass<nr>:SPEech:S01D:FCH?

Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	Unit ring
Forward Radio Configuration,	1 to 4	1	–	
Forward Multiplex Option,	1 to 4	1	–	
Reverse Radio Configuration,	1 to 3	1	–	
Reverse Multiplex Option	1 to 3	1	–	

Description of command	Sig. State	FW vers.
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse fundamental traffic channel for service option 1. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:SPEech:S03D:FCH?
PROCedure:SCONfig:SCLass<nr>:SPEech:S03D:FCH?

Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	Unit ring
Forward Radio Configuration,	1 to 4	1	–	
Forward Multiplex Option,	1 to 4	1	–	
Reverse Radio Configuration,	1 to 3	1	–	
Reverse Multiplex Option	1 to 3	1	–	

Description of command	Sig. State	FW vers.
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse fundamental traffic channel for service option 3. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:SPEech:S17D:FCH?
PROCedure:SCONfig:SCLass<nr>:SPEech:S17D:FCH?

Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	Unit ring
Forward Radio Configuration,	2 to 5	2	–	
Forward Multiplex Option,	2 to 5	2	–	
Reverse Radio Configuration,	2 to 4	2	–	
Reverse Multiplex Option	2 to 4	2	–	

Description of command	Sig. State	FW vers.
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse fundamental traffic channel for service option 17D. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:SPEech:SX8T:FCH?
PROCedure:SCONfig:SCLass<nr>:SPEech:SX8T:FCH?

Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	Unit ring
Forward Radio Configuration,	2 to 5	2	–	
Forward Multiplex Option,	2 to 5	2	–	
Reverse Radio Configuration,	2 to 4	2	–	
Reverse Multiplex Option	2 to 4	2	–	

Description of command	Sig. State	FW vers.
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse fundamental traffic channel for service option X8T. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:SPEech:S01D:FCH:RC[?]
PROCedure:SCONfig:SCLass<nr>:SPEech:S01D:FCH:RC[?]
<F_RC>, <R_RC>

Radio Configuration

<F_RC>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 4 | MINimum | MAXimum | DEFault,	Forward radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	
<R_RC>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 3 | MINimum | MAXimum | DEFault	Reverse radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	

Description of command	Sig. State	FW vers.
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option 1D. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:SPEech:S03D:FCH:RC[?]
PROCedure:SCONfig:SCLass<nr>:SPEech:S03D:FCH:RC[?]
<F_RC>, <R_RC>

Radio Configuration

<F_RC>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 4 | MINimum | MAXimum | DEFault,	Forward radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	
<R_RC>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 3 | MINimum | MAXimum | DEFault	Reverse radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	

Description of command	Sig. State	FW vers.
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option 3D. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:SPEech:S17D:FCH:RC[?] **PROCedure:SCONfig:SCLass<nr>:SPEech:S17D:FCH:RC[?]** *<F_RC>, <R_RC>*			Radio Configuration	
<F_RC>	Description of parameters	Def. value	Def. unit	Unit ring
2 to 5 | MINimum | MAXimum | DEFault,	Forward radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	2	–	
<R_RC>	Description of parameters	Def. value	Def. unit	Unit ring
2 to 4 | MINimum | MAXimum | DEFault	Reverse radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	2	–	
Description of command			Sig. State	FW vers.
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option 17D. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.			See Descript.	V3.05 or Above

CONFigure:SCONfig:SCLass<nr>:SPEech:SX8T:FCH:RC[?] **PROCedure:SCONfig:SCLass<nr>:SPEech:SX8T:FCH:RC[?]** *<F_RC>, <R_RC>*			Radio Configuration	
<F_RC>	Description of parameters	Def. value	Def. unit	Unit ring
2 to 5 | MINimum | MAXimum | DEFault,	Forward radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	2	–	
<R_RC>	Description of parameters	Def. value	Def. unit	Unit ring
2 to 4 | MINimum | MAXimum | DEFault	Reverse radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	2	–	
Description of command			Sig. State	FW vers.
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option X8T. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.			See Descript.	V3.05 or Above

Subsystem BSSignal... (Signal of Base Station/CMU)

The subsystem *BSSignal* configures the RF, traffic channels, and levels of the signals transmitted by the CMU to the mobile station. It corresponds to the tab *BS Signal* in the popup menu *Connection Control*.

UNIT:BSSignal:CHANnel[:RF][?] RF Channel
<RF Channel Unit>

<RF Channel Unit>	Description of parameters	Def. value	Def. unit	Unit ring
CH | HZ | MHZ | KHZ | GHZ	Frequency unit or Channel Number	CH	CH	
Description of command			**Sig. State**	**FW vers.**
This command defines whether the frequency of the RF signal generated is specified in frequency units or as an CDMA channel number. Frequency units must be used to select input signals that are outside the designated CDMA channel range.			SON SOFF REG Q: all	V3.05 or Above

CONFigure:BSSignal:Channel[:RF][?]
PROCedure:BSSignal:Channel[:RF][?] RF Channel
<RF Channel/Freq>

<RF Channel/Freq>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 300 .... 539 to 871 .... 1039 to 1473 .... 1792 to 2016	RF channels, Band Class 5, NTM-450	25		
1 to 799 .... 991 to 1023	RF channels, Band Class 0, US and Korean Cellular	283	–	
0 to 1000 .... 1329 to 2047	RF channels, Band Class 2, TACS	79		
1 to 799 .... 801 to 1039 .... 1041 to 1199 .... 1201 to 1600	RF channels, Band Class 3, JTACS	76	–	
0 to 359	RF channels, Band Class 7, North American 700 MHz	14		
0 to 699	RF channels, Band Class 9, 900 MHz	18		
0 to 919	RF channels, Band Class 10, Secondary 800 MHz	50		
0 to 1199	RF channels, Band Class 1, North American PCS	150	–	
0 to 599	RF channels, Band Class 4, Korean PCS	45	–	
0 to 1499	RF channels, Band Class 8, 1800 MHz PCS	16		
0 to 1199	RF channels, Band Class 6, IMT-2000	12		
Description of command			**Sig. State**	**FW vers.**
This command determines the RF channel number. The frequency changes according to the selected channel number.			CEST Q: all	V3.05 or Above

CONFigure:BSSignal:POWer:CDMA[?]
PROCedure:BSSignal:POWer:CDMA[?]
<CDMA Power>

CDMA Power

<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm |	RF1 OUT , 0 dB ext. atten |	–70.0	dBm	
–120.0 dBm to –16.0 dBm |	RF2 OUT , 0 dB ext. atten |			
–100.0 dBm to 7.0 dBm |	RF3 OUT , 0 dB ext. atten			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command determines total CDMA output power (absolute value, in dBm). CDMA Power value range depends on the RF input used and the external attenuation set.	CEST Q: all	V3.05 or Above

CONFigure:BSSignal:POWer:OUTput?

Output Power

Returned Value	Description of parameters	Def. value	Def. unit	Unit ring
Output Power	–120.0 dBm to –33.0 dBm	NAN	dBm	

Description of command	Sig. State	FW vers.
This command is always a query. It returns the total output power of the CMU, i.e. the CDMA power plus the AWGN level.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:BSSignal:LEVel:FSYNc[?]
<FSYNC Level>

RF Level

<FSYNC Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward Sync Channel Level	–16.0	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	Forward Sync Channel on			
OFF	Forward Sync Channel off			

Description of command	Sig. State	FW vers.
This command determines the signal level of the sync channel in the forward CDMA channel. The power is in units relative to the total CDMA power.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:BSSignal:LEVel:FPICh[?] RF Level
<FPICH Level>

<FPICH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward pilot channel level	–7.0	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	Forward pilot channel on			
OFF	Forward pilot channel off			

Description of command	Sig. State	FW vers.
This command determines the signal level of the pilot channel in the forward CDMA channel.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:BSSignal:LEVel:OCNS:ENABle[?] OCNS Settings
<Mode>

<Mode> (for setting command)	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	OCNS generator on or off	ON	–	

Description of command	Sig. State	FW vers.
This command switches the Orthogonal Channel Noise Simulator on or off. When set to ON, the OCNS level is such that the sum of all generator levels and the OCNS level equals the nominal base station power.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:BSSignal:LEVel:OCNS:VALue? OCNS Settings

Returned Value	Description of parameters	Def. value	Def. unit	Unit ring
OCNS Level	OCNS level relative to CDMA power	–	dB	

Description of command	Sig. State	FW vers.
This command is always a query. It returns the level of the Orthogonal Channel Noise Simulator in units relative to the CDMA power (see `CONFigure:BSSignal:LEVel` command).	All	V3.05 or Above

CONFigure:IMPairments:LEVel:AWGN[?] Impairments
<AWGN Level>

<AWGN Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB |	AWGN level	OFF	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	AWGN generator on			
OFF	AWGN generator off			

Description of command	Sig. State	FW vers.
This command determines the Additive White Gaussian Noise level to impair the RF generator signal.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:IMPairments:FOFFset[:RF][?] Impairments
<Freq. Offset>

<Freq. Offset>	Description of parameters	Def. value	Def. unit	Unit ring
–3.0 kHz to +3.0 kHz |	BS frequency offset setting	OFF	Hz	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	Frequency offset on			
OFF	No frequency offset			

Description of command	Sig. State	FW vers.
This command determines a frequency offset to impair the RF generator signal.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:BSSignal:CHANnel:FFCH[?] Traffic Channel
PROCedure:BSSignal:CHANnel:FFCH[?]
<FFCH Channel>

<FFCH Channel>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 63	Forward fundamental traffic channel	8	–	

Description of command	Sig. State	FW vers.
This command determines the forward fundamental traffic channel number. The command is valid in the Call Established state.	CEST	V3.05 or Above

CONFigure:BSSignal:LEVel:FFCH[?] RF Level
PROCedure:BSSignal:LEVel:FFCH[?]
<FFCH Level>

<FFCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward fundamental traffic channel level	–14.0	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	Forward fundamental traffic channel level on			
OFF	Forward fundamental traffic channel level off			

Description of command	Sig. State	FW vers.
This command determines the signal level of the fundamental traffic channel in the forward CDMA channel.	CEST	V3.05 or Above

CONFigure:BSSignal:FROFfset:FFCH[?] Frame Offset
PROCedure:BSSignal:FROFfset:FFCH[?]
<Frame Offs>

<Frame Offs>	Description of parameters	Def. value	Def. unit	Unit ring
0 to +15	Frame offset	0	–	

Description of command	Sig. State	FW vers.
This command determines an offset for the traffic channel timing in CDMA frames.	CEST	V3.05 or Above

CONFigure:BSSignal:CHANnel:FPCH[?] **PROCedure:BSSignal:CHANnel:FPCH[?]** ***<FPCH Channel>***				Traffic Channel
<FPCH Channel>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 7 |	Forward paging channel	1	–	
Description of command			Sig. State	FW vers.
This command determines the forward paging channel number.			CEST	V3.05 or Above

CONFigure:BSSignal:LEVel:FPCH[?] **PROCedure:BSSignal:LEVel:FPCH[?]** **<FPCH Level>**				RF Level
<FPCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | DEFault | MINimum | MAXimum | ON | OFF	Forward paging channel level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum Forward paging channel level on Forward paging channel level off	–7.0	dB	
Description of command			Sig. State	FW vers.
This command determines the signal level of the paging channel in the forward CDMA channel.			CEST	V3.05 or Above

CONFigure:BSSignal:PROPerty:PNOFfset[?] **PROCedure:BSSignal:PROPerty:PNOFfset[?]** ***<PN Offs>***				PN Offset
<PN Offs>	Description of parameters	Def. value	Def. unit	Unit ring
0 to +511	PN offset	0	–	
Description of command			Sig. State	FW vers.
This command determines an offset for the timing of the pilot channel, the sync channel message, and the long code mask of the paging channel.			CEST Q: all	V3.05 or Above

Subsystem HANDoff:TARGet (Handoff Target)

The subsystem *HANDoff:TARGet* sets the target for a forced handoff of the mobile phone. The corresponding softkeys are located in the tab *Handoff* in the popup menu *Connect. Control*.

STATus:HANDoff:TARGet:LIST?				Destination List
Returns	Description of parameters	Def. value	Def. unit	Unit ring
"CDMA2KCellMS" | "CDMA2KPCSMS" | "CDMA2KIMT2KMS" | "CDMA2K450MS" | "AMPSMS" | "CDMA2KCellMSFallback" | "CDMA2KPCSMSFallback" | "CDMA2KIMT2KMSFallback" | "CDMA2K450MSFallback" | "AMPSMSFallback"	Target list for CDMA (excluding the origin network)	Complete list	–	–
Description of command			Sig. State	FW vers.
This command is always a query and returns a list of all networks that are available for a handoff. On registration, the complete (default) target list is replaced by the actual target list depending on the capabilities of the mobile station.			All	V3.05 or Above

CONFigure:HANDoff:TARGet[?] ***<Handoff Target>***				Destination Selection
<Handoff Target>	Description of parameters	Def. value	Def. unit	Unit ring
"CDMA2KCellMS" | "CDMA2KPCSMS" | "CDMA2KIMT2KMS" | "CDMA2K450MS" | "AMPSMS" | "CDMA2KCellMSFallback" | "CDMA2KPCSMSFallback" | "CDMA2KIMT2KMSFallback" | "CDMA2K450MSFallback" | "AMPSMSFallback"	Target for CDMA handoff	NONE	–	–
NONE	No handoff			
Description of command			Sig. State	FW vers.
This command selects a handoff target. The targets available depend on the current network and on the capabilities of the mobile station; see previous command. The query returns `NONE` unless a destination has been selected before. Handoff is initiated via the `PROCedure:SIGNalling:ACTion HANDoff` command.			CEST Q: all	V3.05 or Above

Subsystem NETWork:IDENtity

The subsystem *NETWork:IDENtity* determines the parameters of the radio network and the existing radio link. The subsystem corresponds to the popup menu *Network* in the menu group *Connection Control*.

CONFigure:NETWork:IDENtity:NID[?] Network ID
<Network ID Number>

<Network ID Number>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 65535 |	Network identity code	"1"	–	–
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command defines the 16-bit network identity code.	SON, SOFF, SYNC Q: all	V3.05 or Above

CONFigure:NETWork:IDENtity:MCC[?] Mobile Country Code
<Mobile Country Code_Network>

<Mobile Country Code_Network>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 999 |	Mobile country code	"999"	–	–
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command defines the mobile country code for the network.	SON, SOFF, SYNC Q: all	V3.05 or Above

Subsystem MSSInfo (Mobile Settings)

The subsystem *MSSInfo* defines the mobile parameters. The subsystem corresponds to the popup menu *Network* in the menu group *Connection Control*.

CONFigure:MSSInfo:ID[?] ***<Mobile ID (MIN/IMSI>***				MS ID Type
<Mobile ID (MIN/IMSI>	Description of parameters	Def. value	Def. unit	Unit ring
{Value} |	34-bit MIN (mobile identification number) or 50-bit IMSI (international mobile subscriber identity)	0000000001	–	–
DEFault	Sets the value to the default setting			
Description of command			Sig. State	FW vers.
This command determines which type of mobile station identity is to be used for call setup to the mobile phone.			SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:MSSInfo:MCC[?] ***<Mobile Country Code>***				MS Country Code
<Mobile Country Code>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 999 |	Mobile country code	999	–	–
DEFault	Sets the value to the default setting			
Description of command			Sig. State	FW vers.
This command defines the mobile station's country code.			SON, SOFF, SYNC Q: all	V3.05 or Above

Subsystem NETWork:SYSTem (System Parameters)

The subsystem *NETWork:System* determines system parameters for the radio connection. The subsystem corresponds to the table field *System Parameters* in the popup menu *Network* in *Connection Control*.

CONFigure:NETWork:SYSTem:SID[?] ***<System ID Number>***				Network System ID
<System ID Number>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 32767 |	System ID number	1	–	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			
Description of command			Sig. State	FW vers.
This command defines the network system identification for the CMU.			SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:NETWork:SYSTem:BSID[?] Base Station ID
<Base Station ID Number>

<Base Station ID Number>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 65535 |	16-bit BTS ID	1	–	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command defines the base station identification for the CMU.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:NETWork:SYSTem:PREVision[?] Protocol Revision
<Protocol Revision>

<Protocol Revision>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 6	Protocol Revision	6	–	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command defines the version of the transmission protocol for the CMU to use.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:NETWork:SYSTem:MPRevision[?] Minimum Protocol Revision
<Minimum Protocol Revision>

<Minimum Protocol Revision>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 6 |	Minimum protocol revision	1	–	–
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command defines the minimum protocol revision capability of the mobile station.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:NETWork:SYSTem:IMSI:ETWelve[?] BS IMSI
<IMSI 11 12>

<IMSI 11 12>	Description of parameters	Def. value	Def. unit	Unit ring
00 to 99 |	ASCII value	01	–	–
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command defines an ASCII string containing two digits representing the 11th and 12th digit of the IMSI of the base station.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:NETWork:SYSTem:UWCard[?] ***<State Use Wildcard>***			State Use Wildcard	
<State Use Wildcard>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Special values for MCC and IMSI_11_12 on or off.	OFF	–	–
Description of command			Sig. State	FW vers.
This value indicates whether to use special values for MCC and IMSI_11_12 that indicate to the mobile that it needs to use only IMSI_S.			SOFF SON SYNC Q: all	V3.05 or Above

Subsystem NETWork:PCHannel (Paging Channel)

The subsystem *NETWork:PCHannel* determines the paging channel parameters. The subsystem corresponds to the table field *Paging Channel* in the popup menu *Network.*

CONFigure:NETWork:PCHannel:RATE ***<Paging Channel Rate>***			Paging Channel Rate	
<Paging Channel Rate>	Description of parameters	Def. value	Def. unit	Unit ring
R4K8 | R9K6 | DEFault	4800 bps data rate 9600 bps data rate Sets the value to the default setting	R9K6	Bps	
Description of command			Sig. State	FW vers.
This command sets the date rate of the paging channel.			SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:NETWork:PCHannel:SCINdex[?] ***<Paging CH Slot Cycle Index>***			Slot Cycle Index	
<Paging CH Slot Cycle Index>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 7 | MINimum | MAXimum | DEFault	10-bit Slot Cycle index Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	0	–	
Description of command			Sig. State	FW vers.
This command determines the length of the slot cycle by setting the number of slots in the slot cycle. Each slot cycle equals 1.28 seconds. The number of slots in the slot cycle is determined by the formula: Slot cycle = 1.28×2^i (where i equals the slot cycle index) For example: i = 0 Slot cycle = 1.28 seconds i = 1 Slot cycle = 2.56 seconds i = 2 Slot cycle = 5.12 seconds The paging channel is monitored during the slot cycle when operating in the slotted mode. A mobile stations slot occurs once per slot cycle			SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:NETWork:PCHannel:MSCindex[?] Max. Slot Cycle Index
<Max Slot Cycle Index>

<Max Slot Cycle Index>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 7 |	Maximum 10-bit slot cycle index	0	–	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command sets the maximum slot cycle index allowed to determine the slot cycle length.	SOFF SON SYNC Q: all	V3.05 or Above

Subsystem NETWork:REGistration

The subsystem *NETWork:REGistration* defines when the registration procedure is to be performed.

CONFigure:NETWork:REGistration:HOME[?] Registration Home
<Registration Home>

<Registration Home>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Home registration on or off	ON	–	

Description of command	Sig. State	FW vers.
This command enables the home (non-roaming) registration mode.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:NETWork:REGistration:FSID[?] Registration FSID
<Registration SID>

<Registration SID>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Foreign System ID registration on or off	ON	–	

Description of command	Sig. State	FW vers.
This command determines whether a registration procedure is to be executed when the system identity is changed.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:NETWork:REGistration:FNID[?] Registration FNID
<Registration NID>

<Registration NID>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Foreign Network ID registration on or off	ON	–	

Description of command	Sig. State	FW vers.
This command determines whether a registration procedure is to be executed when the network identity is changed.	SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:NETWork:REGistration:PUP[?] ***<Registration Up>***			Registration Power Up	
<Registration Up>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Power up registration on or off	ON	–	
Description of command			Sig. State	FW vers.
This command determines whether a registration procedure is to be executed on power-up of the mobile station.			SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:NETWork:REGistration:PDOWn[?] ***<Registration Down>***			Registration Power Down	
<Registration Down>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Registration at power down on or off	ON	–	
Description of command			Sig. State	FW vers.
This command determines whether a registration procedure is to be executed on power-down of the mobile station.			SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:NETWork:REGistration:PARameter[?] ***<Registration Reg>***			Registration Parameter	
<Registration Reg>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Parameter registration mode on of off	ON	–	
Description of command			Sig. State	FW vers.
This command determines whether a registration procedure is to be executed after a parameter change.			SOFF SON SYNC Q: all	V3.05 or Above

Test Object NPOWer

The subsystem *NPOWer* measures the Narrow Band Power using CDMA2000 receiver filters. Narrow Band Power is only available via GPIB control. There is no corresponding measurement available from the function groups in the front panel menus.

Control of measurement – Subsystem NPOWer

The subsystem *NPOWer* controls the maximum output measurement.

INITiate:NPOWer **ABORt:NPOWer** **STOP:NPOWer** **CONTinue:NPOWer**	Start new measurement Abort running measurement and switch off Stop measurement after current stat. cycle Next measurement step (*stepping mode*)		⇒ *RUN* ⇒ *OFF* ⇒ *STOP* ⇒ *RUN*
Description of command		Sig. State	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.		All	V3.05 or Above

CONFigure:NPOWer:EREPorting[?] ***<Report Mode>***				Event Reporting
<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	
Description of command			Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).			All	V3.05 or Above

FETCh[:SCALar]:NPOWer:STATus?			Measurement Status	
Returns	Description of parameters	Def. value	Def. unit	Unit ring
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	–
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).			All	V3.05 or Above

CONFigure:NPOWer:EPOWer[?] ***<Expected Power>***			Expected Power	
<Expected Power>	Description of parameters	Def. value	Def. unit	Unit ring
–100 dB to 10 dB | MINimum | MAXimum | DEFault	Expected power of the mobile station Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	–20	dB	
Description of command			Sig. State	FW-Vers.
This command sets the total expected power from the mobile station.			All	V3.05 or Above

Subsystem NPOWer:CONTrol

The subsystem *NPOWer:CONTrol* defines the repetition mode and statistic count of the measurement.

CONFigure:NPOWer:CONTrol[?] ***<Statistics >**, **<Repetition>**, **<Stop Condition>**, **<Step Mode>***			Scope of Measurement	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 | MINimum | MAXimum | DEFault,	Number of bursts per statistics cycle Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 100000 | CONTuous | SINGleshot| DEFault,	Multiple measurement (*counting*, until `Status = STEP | RDY`) Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`)	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)*	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | STEP	Continue measurement according to its rep. mode Interrupt measurement after each statistics cycle	NONE	–	
Description of command			Sig. State	FW-Vers.
This command determines the number of statistics cycles, the repetition, the stop condition, and the stepping mode for the measurement.			All	V3.05 or Above

CONFigure:NPOWer:CONTrol:STATistics[?] ***<Statistics >***			Scope of Measurement	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 | MINimum | MAXimum | DEFault	Number of bursts per statistics cycle Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	100	–	
Description of command			Sig. State	FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.			All	V3.05 or Above

CONFigure:NPOWer:CONTrol:REPetition[?] ***<Repetition>, <Stop Cond>, <Step Mode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 CONTinuous | SINGleshot | DEFault,	Multiple measurement (*counting*, until `Status = STEP | RDY`) Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`)	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Default value	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | STEP | DEFault	Continue measurement according to its rep. mode Interrupt measurement after each statistics cycle Default value	NONE	–	
Description of command			Sig. State	FW vers.
This command determines the repetition mode of the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*			All	V3.05 or Above

Measured Values – Subsystem NPOWer

The subsystem *NPOWer* determines and outputs the results of the Narrow Band Power measurements.

READ[:SCALar]:NPOWer? **FETCh[:SCALar]:NPOWer?** **SAMPle[:SCALar]:NPOWer?**	Scalar results: Start single shot measurement and return results Read out measurement results (unsynchronized) Read out measurement results (synchronized)			
Returned values	Value range	Def. value	Def. unit	Unit ring
Current Average Power,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Current Min Power,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Current Max Power,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Average Average Power,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Average Min Power,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Average Max Power	–100.0 dBm to –50.0 dBm	NAN	dBm	
Description of command			Sig. State	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results.			All	V3.05 or Above

Subsystems INPut, OUTPut, CORRection (External Attenuation at the Connectors)

These subsystems contain the commands for configuration of the input and output connectors. The subsystem corresponds to the tab RF ⊙ in the popup menu *Connect. Control*.

INPut[:STATe] <*State*>				RF Input
<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 RF2 RF4	Connector RF1 used as input Connector RF2 used as input Connector RF4 IN used as input	RF2	–	–
Description of command			Sig. State	FW vers.
This command determines the connector to be used for RF input signals. The bi-directional connectors RF 1 and RF 2 can be used both as input and output connectors in the same measurement (see OUTPut[:STATe]). Only one input and one output may be active at the same time, a new RF input setting supersedes the previous one.			All	V3.05 or Above

OUTPut[:STATe] <*State*>				RF Output
<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 RF2 RF3	Connector RF1 used as output Connector RF2 used as output Connector RF3 OUT used as output	RF2	–	–
Description of command			Sig. State	FW vers.
This command determines the connector to be used for RF output signals. The bi-directional connectors RF 1 and RF 2 can be used as input and output connectors in the same measurement (see `INPut[:STATe]`). Only one input and one output may be active at the same time, a new RF output setting supersedes the previous one.			All	V3.05 or Above

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] <*Attenuation*> SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude] <Attenuation>				Ext. Att. Input
<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +90 dB	Value for external attenuation at output <nr>, where <nr> = 1, 2, 4	0.0	dB	Ratio
Description of command			Sig. State	FW vers.
This command assigns an external attenuation value to the inputs of the instrument *(RF 1, RF 2, RF 4 IN)*.			All	V3.05 or Above

[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude] SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude] <Attenuation>				Ext. Att. Output
<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +90 dB	Value for external attenuation at output <nr>, where <nr> = 1, 2, 3	0.0	dB	Ratio
Description of command			Sig. State	FW vers.
This command assigns an external attenuation value to the outputs of the instrument *(RF 1, RF 2, RF 3 OUT)*.			All	V3.05 or Above

Subsystem DM:CLOCk (Synchronization)

The subsystem *DM:CLOCk* sets a system clock specific to the network. This frequency is set in the tab *Synch.* in the popup menu *Connection Control*.

SOURce:DM:CLOCk:STATe ***<Mode>***				REF OUT 2 on/off
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on/off system clock	OFF	–	–
Description of command			Sig. State	FW vers.
This command switches the system clock at output *REF OUT 2* on or off.			All	V3.05 or Above

Test Object OVERview

The subsystem *OVERview* measures the most important power, modulation, and receiver quality parameters using a set of configuration settings that is independent of the other measurement groups *(POWer, MODulation, Code Domain Power, RXQuality)*. The subsystem corresponds to the *Overview* menu and the associated popup menu *Overview Configuration.*

General Configurations – Subsystem OVERview:MCQuality (O-QPSK and H-PSK)

The subsystem *OVERview:MCQuality* configures the generated RF signal. It corresponds to the *Overview Meas. & Channel Qual. Settings* panel in the *Overview* menu and the associated softkeys.

> ***Note:** The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:OVERview:MCQuality:LEVel[?] ***<CDMA Power>, <FCH Level>, <Pilot Level>***				CDMA Levels
<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm |	RF1 OUT , 0 dB ext. atten |	–60.0	dBm	
–120.0 dBm to –16.0 dBm |	RF2 OUT , 0 dB ext. atten |			
–100.0 dBm to +7.0 dBm |	RF3 OUT , 0 dB ext. atten			
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum,	Sets the value to the range maximum			
<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	FCH Level	–7.4	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum,	Sets the value to the range maximum			
<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Pilot Level	–7.0	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum	Sets the value to the range maximum			
Description of command			Sig. State	FW vers.
This command determines the output signal levels of the CMU. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA power value range depends on the RF input used and the external attenuation set. It combines the commands `...:CONTrol:POWer:CDMA` and `...:CONTrol:LEVel`.			SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:OVERview:MCQuality:CONTrol:POWer:CDMA[?] ***<CDMA Power>***				CDMA Levels
<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to +7.0 dBm | DEFault | MINimum | MAXimum	RF1 OUT , 0 dB ext. atten | RF2 OUT , 0 dB ext. atten | RF3 OUT , 0 dB ext. atten Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–60.0	dBm	
Description of command			Sig. State	FW vers.
This command determines the total CDMA output power (absolute value, in dBm) of the CMU. The CDMA Power value range depends on the RF input used and the external attenuation set.			SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:OVERview:MCQuality:CONTrol:LEVel[?] ***<FCH Level>, <Pilot Level>***				CDMA Levels
<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | DEFault | MINimum | MAXimum,	FCH Level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–7.4	dB	
<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | DEFault | MINimum | MAXimum	Pilot Level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–7.0	dB	
Description of command			Sig. State	FW vers.
This command determines the levels in the forward traffic channel and the forward pilot channel of the CMU. The individual channel powers are in units relative to the total CDMA power.			SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:OVERview:MCQuality:IMPairments[?] Impairments
<AWGN Level>, <BS Freq Offset>

<AWGN Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB |	AWGN level	OFF	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF,				
<BS Freq Offset>	Description of parameters	Def. value	Def. unit	Unit ring
–50.0 kHz to +50.0 kHz |	BS frequency offset	OFF	kHz	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF				
Description of command			Sig. State	FW vers.
This command determines an Additional White Gaussian Noise level and a frequency offset to impair the CMU output signal.			SOFF SON SYNC Q: all	V3.05 or Above

CONFigure:OVERview:MCQuality:PCBits[?] Power Control Bits
<Power Control Bits>

<Power Control Bits>	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Disable power control bits	AUTO	–	
AUTO |	Auto mode, closed-loop operation			
HOLD |	Alternating up/down control bits			
ADOW |	All power control bits down			
AUP |	All power control bits up			
RTES	Range test mode			
Description of command			Sig. State	FW vers.
This command defines the power control bits in the RF generator signal.			SOFF SON SYNC Q: all	V3.05 or Above

General Configurations – Subsystem OVERview:PPOWer

The subsystem *OVERview:PPOWer* controls the pilot power measurement. It corresponds to the *Pilot Power* softkey in the *Overview* menu.

CONFigure:OVERview:PPOWer:ENABle[?] Pilot Power Enable
<Enable>

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Activate/disable the pilot power report	ON	–	
Description of command			Sig. State	FW vers.
This command activates or disables the transmission of the pilot power measured by the mobile station.			All	V3.05 or Above

[SENSe:]OVERview:PPOWer?				Pilot Power
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
Reported PPower, Actual PPower	–20 dB to –7 dB –20 dB to –7 dB	INV INV	dB dB	
Description of command			Sig. State	FW vers.
This command is always a query. It returns the pilot power reported by the mobile station and the actual pilot power transmitted by the CMU.			All	V3.05 or Above

Overview Measurement Control – Subsystem OVERview:OVERview

The subsystem *OVERview:OVERview* controls the measurement of general power and modulation parameters. It corresponds to the *Overview Meas.* softkey in the *Overview* menu and the associated output fields and to the *Overview Configuration* menu.

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:OVERview:OVERview[:OQPSk]	Start new measurement	⇒	*RUN*
ABORt:OVERview:OVERview[:OQPSk]	Abort running measurement and switch off	⇒	*OFF*
STOP:OVERview:OVERview[:OQPSk]	Stop measurement after current stat. cycle	⇒	*STOP*
CONTinue:OVERview:OVERview[:OQPSk]	Next measurement step (*stepping mode*)	⇒	*RUN*
INITiate:OVERview:OVERview:HPSK	Start new measurement	⇒	*RUN*
ABORt:OVERview:OVERview:HPSK	Abort running measurement and switch off	⇒	*OFF*
STOP:OVERview:OVERview:HPSK	Stop measurement after current stat. cycle	⇒	*STOP*
CONTinue:OVERview:OVERview:HPSK	Next measurement step (*stepping mode*)	⇒	*RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the overview measurement, setting it to the status indicated in the top right column.	All	V3.05 or Above

FETCh[:SCALar]:OVERview:OVERview[:OQPSk]:STATus?
FETCh[:SCALar]:OVERview:OVERview:HPSK:STATus?
Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	–
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	–

Description of command	Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	All	V3.05 or Above

CONFigure:OVERview:OVERview[:OQPSk]:EREPorting[?]
CONFigure:OVERview:OVERview:HPSK:EREPorting[?]
<Report Mode>

Event Reporting

<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF | DEFault	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	

Description of command	Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All	V3.05 or Above

Subsystem OVERview:OVERview:CONTrol

The subsystem *OVERview:OVERview:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs of the popup menu *Overview Configuration.*

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:OVERview:OVERview[:OQPSk]:CONTrol[?]
CONFigure:OVERview:OVERview:HPSK:CONTrol[?]
<Statistic Count>, <Repetition>, <Stop Cond>, <Step Mode>

Scope of Measurement

<Statistic Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 | CONTuous | SINGleshot | DEFault,	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Default setting	NONE	–	

Description of command	Sig. State	FW-Vers.
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.	All	V3.05 or Above

CONFigure:OVERview:OVERview[:OQPSk]:CONTrol:STATistics[?] Elapsed Statistic
CONFigure:OVERview:OVERview:HPSK:CONTrol:STATistics[?]
<Statistic Count>

<Statistic Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	

Description of command	Sig. State	FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.	All	V3.05 or Above

CONFigure:OVERview:OVERview[:OQPSk]:CONTrol:REPetition[?] Test Cycles
CONFigure:OVERview:OVERview:HPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY	SING	–	
CONTuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Default value			

<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Default value			

<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement according to its rep. mode	NONE	–	
STEP |	Interrupt measurement after each statistics cycle			
DEFault	Default value			

Description of command	Sig. State	FW vers.
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All	V3.05 or Above

CONFigure:OVERview:OVERview[:OQPSk]:CONTrol:FOFFset:SBSuppress[?] Impairments
CONFigure:OVERview:OVERview:HPSK:CONTrol:FOFFset:SBSuppress[?]
<SB Freq. Offset>

<SB Freq. Offset>	Description of parameters	Def. value	Def. unit	Unit ring
–1.6 MHz to +1.6 MHz |	Sideband Suppres Frequency Offset setting	900000	Hz	
DEFault |	Default value			
MINimum |				
MAXimum |				
OFF	No frequency offset			

Description of command	Sig. State	FW vers.
This command determines a frequency offset to impair the signal for the sideband suppres measurement.	All	V3.05 or Above

DEFault:OVERview:OVERview[:OQPSk]:CONTrol[?] **DEFault:OVERview:OVERview:HPSK:CONTrol[?]**				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem OVERview:OVERview:CONTrol to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.			All	V3.05 or Above

Test Configuration

The commands of the following subsystem determine the parameters of the overview measurement.

Subsystem OVERview:OVERview:LIMit

The subsystem *OVERview:OVERview:...LIMit* defines the tolerance values for the overview measurement. The subsystem corresponds to the *Overview Limits* section in the *Limits* tab in the popup menu *Overview Configuration.*

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:OVERview:OVERview[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?] **CONFigure:OVERview:OVERview:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?]** ***<Carrier Freq. Error>, <Enable>, <Transmit Time Error>, <Enable>, <Waveform Quality>, <Enable>, <Enable>, <Sideband Suppr.>, <Enable>***				Limits
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch limit check for parameter preceding *<Enable>* on or off	ON	–	
<Carrier Freq. Error>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 Hz to +1000.0 Hz,	Upper limit for carrier frequency error	+300	Hz	
<Transmit Time Error>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 µs to 10.0 µs,	Upper limit for transmit time error	1.0	µs	
<Waveform Quality>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to 1.0	Lower limit for waveform quality	0.944	–	
<Sideband Suppr. Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–128 to 0	Upper sideband suppres limit	–43	dB	
Description of command			Sig. State	FW vers.
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keywords `CMMax` and `AVERage` refer to the *Current* and *Max./Min.* display and *Average* display, respectively. After each parameter definition, the limit check for this parameter can be enabled or disabled. Limit definition and enabling of the limit check can be done separately.			All	V3.05 or Above

Limits

CONFigure:OVERview:OVERview[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?]
CONFigure:OVERview:OVERview:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?]

<Carrier Freq. Error>*, *<Enable>*, *<Transmit Time Error>*, *<Enable>*, *<Waveform Quality>*, *<Enable>*, *<Sideband Suppr.>*, *<Enable>

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch limit check for parameter preceding *<Enable>* on or off	ON	–	
<Carrier Freq. Error>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 Hz to +1000.0 Hz,	Upper limit for carrier frequency error	+300	Hz	
<Transmit Time Error>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 μs to 10.0 μs,	Upper limit for transmit time error	1.0	μs	
<Waveform Quality>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to 1.0	Lower limit for waveform quality	0.944	–	
<Sideband Suppr.>	Description of parameters	Def. value	Def. unit	Unit ring
–128 to 0	Upper sideband suppres limit	–43	dB	

Description of command	Sig. State	FW vers.
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keywords `CMMax` and `AVERage` refer to the *Current* and *Max./Min.* display and *Average* display, respectively. After each parameter definition, the limit check for this parameter can be enabled or disabled. Limit definition and enabling of the limit check can be done separately.	All	V3.05 or Above

Limit Enable

CONFigure:OVERview:OVERview[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]
CONFigure:OVERview:OVERview:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]

<Carrier Freq Error>*, *<Transmit Time Error>*, *<Waveform Quality>*, *<Sideband Suppr.>

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch limit check for corresponding parameter on or off.	ON	–	

Description of command	Sig. State	FW vers.
This command enables or disables the limit check for the different traces and for the scalar modulation parameters derived from them. The keywords `CMMax` and `AVERage` refer to the *Current* and *Max./Min.* display and *Average* display, respectively.	All	V3.05 or Above

Limit Enable

CONFigure:OVERview:OVERview[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]
CONFigure:OVERview:OVERview:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]

<Carrier Freq Error>*, *<Transmit Time Error>*, *<Waveform Quality>*, *<Sideband Suppr.>

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch limit check for corresponding parameter on or off.	ON	–	

Description of command	Sig. State	FW vers.
This command enables or disables the limit check for the different traces and for the scalar modulation parameters derived from them. The keywords `CMMax` and `AVERage` refer to the *Current* and *Max./Min.* display and *Average* display, respectively.	All	V3.05 or Above

Overview Limits

CONFigure:OVERview:OVERview[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
CONFigure:OVERview:OVERview:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
<Carrier Freq. Error>, <Transmit Time Error>, <Waveform Quality>, <Sideband Suppr.>

<Carrier Freq. Error>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 Hz to +1000.0 Hz,	Upper limit for carrier frequency error	+300	Hz	
<Transmit Time Error>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 µs to 10.0 µs,	Upper limit for transmit time error	1.0	µs	
<Waveform Quality>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to 1.0	Lower limit for waveform quality	0.944	–	
<Sideband Suppr.>	Description of parameters	Def. value	Def. unit	Unit ring
–128 to 0	Upper sideband suppres limit	–43	dB	
Description of command			Sig. State	FW vers.
This commands defines the upper limits for the overview measurement. The keywords `CMMax` and `AVERage` refer to the *Current* and *Max./Min.* display and *Average* display, respectively.			All	V3.05 or Above

Overview Limits

CONFigure:OVERview:OVERview[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
CONFigure:OVERview:OVERview:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
<Carrier Freq Error>, <Transmit Time Error>, <Waveform Quality>, <Sideband Suppr.>

<Carrier Freq. Error>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 Hz to +1000.0 Hz,	Upper limit for carrier frequency error	+300	Hz	
<Transmit Time Error>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 µs to 10.0 µs,	Upper limit for transmit time error	1.0	µs	
<Waveform Quality>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to 1.0	Lower limit for waveform quality	0.944	–	
<Sideband Suppr.>	Description of parameters	Def. value	Def. unit	Unit ring
–128 to 0	Upper sideband suppres limit	–43	dB	
Description of command			Sig. State	FW vers.
This commands defines the upper limits for the overview measurement. The keywords `CMMax` and `AVERage` refer to the *Current* and *Max./Min.* display and *Average* display, respectively.			All	V3.05 or Above

Measured Values – Subsystem OVERview:OVERview

The subsystem *OVERview:OVERview* determines and outputs the results of the overview measurement. In the *Overview* menu, it corresponds to the output fields associated to the *Overview Meas.* softkey.

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

	Scalar results:
READ[:SCALar]:OVERview:OVERview[:OQPSk]?	Start single shot measurement and return results
FETCh[:SCALar]:OVERview:OVERview[:OQPSk]?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:OVERview:OVERview[:OQPSk]?	Read out measurement results (synchronized)
READ[:SCALar]:OVERview:OVERview:HPSK?	Start single shot measurement and return results
FETCh[:SCALar]:OVERview:OVERview:HPSK?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:OVERview:OVERview:HPSK?	Read out measurement results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
Expected MS Power (x3),	–100 dB to 10 dB	NAN	dBm	
Measured MS Power (x3),	–100 dB to 10 dB	NAN	dBm	
Carrier Frequency Error (x3),	0 to 1000.0 Hz	NAN	MHz	
Expected Carrier Frequency (x3),	0 to 1000.0 Hz	NAN	Hz	
Transmit Time Error (x3),	0.0 μs to 10.0 μs	NAN	μs	
Waveform Quality (x3),	0.0 to 1.0	NAN	–	
Lower Sideband Suppres (x3),	–128 dB to 0	NAN	dB	
Upper Sideband Suppres (x3)	–128 dB to 0	NAN	dB	

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results (see Chapter 5). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.	All	V3.05 or Above

CALCulate[:SCALar]:OVERview:OVERview[:OQPSk]:MATChing:LIMit? **CALCulate[:SCALar]:OVERview:OVERview:HPSK:MATChing:LIMit?**	Limit Matching

Returned values	Value range	Def. value	Def. unit	Unit ring
Carrier Frequency Error (x3),	For all values:	INV	–	
Transmit Time Error (x3),	NMAU | NMAL | INV | OK	INV	–	
Waveform Quality (x3),		INV	–	
Sideband Suppr		INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the tolerances for the overview measurement have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value. The following messages may be generated:	All	V3.05 or Above

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

Overview Measurement Control – Subsystem OVERview:CQUality

The subsystem *OVERview:CQUality* controls the measurement of general channel quality parameters. It corresponds to the *Channel Quality* hotkey in the *Overview* menu and the associated output fields and to the *Channel Quality* sections of the *Overview Configuration* menu.

INITiate:OVERview:CQUality	Start new measurement	⇒	RUN
ABORt:OVERview:CQUality	Abort running measurement and switch off	⇒	OFF
STOP:OVERview:CQUality	Stop measurement after current stat. cycle	⇒	STOP
CONTinue:OVERview:CQUality	Next measurement step (only stepping mode)	⇒	RUN

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the overview measurement, setting it to the status indicated in the top right column.	All	V3.05 or Above

CONFigure:OVERview:CQUality:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF | DEFault	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	

Description of command	Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All	V3.05 or Above

FETCh[:SCALar]:OVERview:CQUality:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	–
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	–

Description of command	Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	All	V3.05 or Above

Subsystem OVERview:CQUality:CONTrol

The subsystem *OVERview:CQUality:CONTrol* defines the statistic count, repetition mode, and stop condition of the measurement. These settings are provided in the *Control* and *Limits* tabs of the popup menu *Overview Configuration.*

CONFigure:OVERview:CQUality:CONTrol:FRAMes[?] Maximum Frame Number
<Max Frames>

<Max Frames>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000	Maximum frames	1000	–	

Description of command	Sig. State	FW vers.
This command determines the maximum number of frames used to calculate the frame error rate.	All	V3.05 or Above

CONFigure:OVERview:CQUality:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
CONTuous |	Continuous measurement (until `STOP` or `ABORT`)			
SINGleshot |	Single shot measurement (until `Status = RDY`)			
DEFault,				
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,				
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE |	Continue measurement according to its rep. mode			
DEFault				

Description of command	Sig. State	FW vers.
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All	V3.05 or Above

DEFault:OVERview:CQUality:CONTrol[?]		Default Settings		
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem OVERview:CQUality:CONTrol to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.			All	V3.05 or Above

Test Configuration

The commands of the following subsystem determine the parameters of the channel quality measurement.

Note: *In order to perform channel quality and receiver quality measurements and to obtain a meaningful results, an appropriate test setup is required (see application examples in Chapter 2 of this manual). Consequently, for these types of measurements, the Call Established (CEST) signalling state must be reached before any of the commands retrieving test results (`READ...?`, `FETCh...?`, `SAMPle...?`, or `CALCulate...LIMit?`) can be used. Test configurations, however, can be defined any time.*

Subsystem OVERview:CQUality:LIMit

The subsystem *OVERview:CQUality:...LIMit* defines the tolerance values for the overview measurement. The subsystem corresponds to the *Channel Quality* section in the *Limits* tab in the popup menu *Overview Configuration.*

CONFigure:OVERview:CQUality:CAMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?] ***<Maximum FER>***		Channel Quality Limits		
Maximum FER	Description of parameters	Def. value	Def. unit	Unit ring
0.1% to +5.0%	Upper limit for frame error rate	0.5	%	
Description of command			Sig. State	FW vers.
This commands defines the upper limits for the channel quality measurement.			All	V3.05 or Above

DEFault:OVERview:CQUality:LIMit[?] *<Enable>*		Limit Default Settings		
Enable	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from their default values (partially or totally)	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem OVERview:CQUality:LIMit to their default values (the setting OFF results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.			All	V3.05 or Above

Measured Values – Subsystem OVERview:CQUality

The subsystem *OVERview:CQUality* determines and outputs the results of the channel quality measurement. In the *Overview* menu, it corresponds to the output fields associated to the *Channel Quality* hotkey.

READ[:SCALar]:OVERview:CQUality? **FETCh[:SCALar]:OVERview:CQUality?** **SAMPle[:SCALar]:OVERview:CQUality?**		Scalar results: Start single shot measurement and return results Read out measurement results (unsynchronized) Read out measurement results (synchronized)		
Returned values	Value range	Def. value	Def. unit	Unit ring
Frames transmitted,	1 to 1000	NAN	–	
Frame Error Rate	0% to 100%	NAN	%	
Description of command			Sig. State	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results (see Chapter 5).			All	V3.05 or Above

CALCulate[:SCALar]:OVERview:CQUality:MATChing:LIMit?		Limit Matching		
Returned values	Value range	Def. value	Def. unit	Unit ring
FER Limit	NMAU | NMAL | INV | OK	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the tolerances for the overview measurement have been exceeded. The following messages may be generated: NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched			All	V3.05 or Above

Test Object POWer:MIOutput

The subsystem *POWer:MIOutput* measures the MS minimum output power. The subsystem corresponds to the measurement menu *Power,* application *Minimum Output,* and the sections related to this application in the associated popup menu *Power Configuration.*

Control of measurement – Subsystem POWer:MIOutput

The subsystem *POWer:MIOutput* controls the minimum output measurement.

> ***Note:** The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:POWer:MIOutput[:OQPSk]	Start new measurement	⇒	*RUN*
ABORt:POWer:MIOutput[:OQPSk]	Abort running measurement and switch off	⇒	*OFF*
STOP:POWer:MIOutput[:OQPSk]	Stop measurement after current stat. cycle	⇒	*STOP*
CONTinue:POWer:MIOutput[:OQPSk]	Next measurement step (only *stepping mode*)	⇒	*RUN*
INITiate:POWer:MIOutput:HPSK	Start new measurement	⇒	*RUN*
ABORt:POWer:MIOutput:HPSK	Abort running measurement and switch off	⇒	*OFF*
STOP:POWer:MIOutput:HPSK	Stop measurement after current stat. cycle	⇒	*STOP*
CONTinue:POWer:MIOutput:HPSK	Next measurement step (only *stepping mode*)	⇒	*RUN*
Description of command		Sig. State	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.		All	V3.05 or Above

CONFigure:POWer:MIOutput[:OQPSk]:EREPorting[?] **CONFigure:POWer:MIOutput:HPSK:EREPorting[?]** ***<Report Mode>***				Event Reporting
<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF, DEFault	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	
Description of command			Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).			All	V3.05 or Above

FETCh[:SCALar]:POWer:MIOutput[:OQPSk]:STATus? **FETCh[:SCALar]:POWer:MIOutput:HPSK:STATus?**				Measurement Status
Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	–
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).			All	V3.05 or Above

Subsystem POWer:MIOutput:CONTrol

The subsystem *POWer:MIOutput:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs in the popup menu *Power Configuration.*

> ***Note:** The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:POWer:MIOutput[:OQPSk]:CONTrol[?] Scope of Measurement
CONFigure:POWer:MIOutput:HPSK:CONTrol[?]
<Statistics>, <Repetition>, <Stop Cond>, <Step Mode>

<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
CONTuous |	Continuous measurement (until `STOP` or `ABORT`)			
SINGleshot|	Single shot measurement (until `Status = RDY`)			
DEFault,				
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,				
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE |	Continue measurement according to its rep. mode			
DEFault				
Description of command			Sig. State	FW-Vers.
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.			All	V3.05 or Above

CONFigure:POWer:MIOutput[:OQPSk]:CONTrol:STATistics[?] Statistic Count
CONFigure:POWer:MIOutput:HPSK:CONTrol:STATistics[?]
<Statistics>

<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 |	Number of bursts per statistics cycle	100	–	
NONE	Statistics off (equivalent to 1)			
Description of command			Sig. State	FW-Vers.
This command specifies the number of bursts forming a statistics cycle.			All	V3.05 or Above

CONFigure:POWer:MIOutput[:OQPSk]:CONTrol:REPetition[?]
CONFigure:POWer:MIOutput:HPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>

Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
CONTuous | SINGleshot| DEFault,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`)			

<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)*	NONE	–	

<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command	Sig. State	FW vers.
This command determines the repetition mode, stop condition, and stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:`...), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All	V3.05 or Above

DEFault:POWer:MIOutput[:OQPSk]:CONTrol[?]
DEFault:POWer:MIOutput:HPSK:CONTrol[?]

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from their default values (partially or totally)	ON	–	

Description of command	Sig. State	FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem POWer:MIOutput:CONTrol to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	All	V3.05 or Above

Test Configuration

The commands of the following subsystems determine the parameters of the signal power measurement. They correspond to the different softkey/hotkey combinations in the graphical measurement menu and to the *Power Configuration* popup menu.

> **Note:** *The modulation scheme reference O-QPSK is omitted from the commands to remain compatible with cdmaOne. The modulation scheme reference H-PSK contains the type in the command. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:POWer:MIOutput[:OQPSk]:LEVel[?]
CONFigure:POWer:MIOutput:HPSK:LEVel[?]
<CDMA Power>, <FCH Level>, <Pilot Level>

CDMA Levels

<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm |	RF1 OUT , 0 dB ext. atten |	–25.0	dBm	
–120.0 dBm to –16.0 dBm |	RF2 OUT , 0 dB ext. atten |	–25.0	dBm	
–100.0 dBm to +7.0 dBm	RF3 OUT , 0 dB ext. atten	–25.0	dBm	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum,	Sets the value to the range maximum			

<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward fundamental traffic channel level	–7.4	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum,	Sets the value to the range maximum			

<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward pilot level	–7.0	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum	Sets the value to the range maximum			

Description of command	Sig. State	FW vers.
This command determines the output signal levels of the CMU. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set. It combines the commands `...:CONTrol:POWer:CDMA` and `...:CONTrol:LEVel`.	All	V3.05 or Above

CONFigure:POWer:MIOutput:OQPSk:CONTrol:POWer:CDMA[?]
CONFigure:POWer:MIOutput:HPSK:CONTrol:POWer:CDMA[?]
<CDMA Power>

CDMA Levels

<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm |	RF1 OUT , 0 dB ext. atten |	–25.0	dBm	
–120.0 dBm to –16.0 dBm |	RF2 OUT , 0 dB ext. atten |	–25.0	dBm	
–100.0 dBm to +7.0 dBm	RF3 OUT , 0 dB ext. atten	–25.0	dBm	

Description of command	Sig. State	FW vers.
This command determines the total CDMA output power (absolute value, in dBm) of the CMU. The CDMA Power value range depends on the RF input used and the external attenuation set.	All	V3.05 or Above

CONFigure:POWer:MIOutput:OQPSk:CONTrol:LEVel[?] CDMA Levels
CONFigure:POWer:MIOutput:HPSK:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>

<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | DEFault | MINimum | MAXimum,	Forward fundamental traffic channel level Default value Sets the value to the range minimum Sets the value to the range maximum	–7.4	dB	
<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | DEFault | MINimum | MAXimum	Forward pilot level Default value Sets the value to the range minimum Sets the value to the range maximum	–7.0	dB	

Description of command	Sig. State	FW vers.
This command determines the levels in the forward traffic channel and the forward pilot channel of the CMU. The individual channel powers are in units relative to the total CDMA power.	All	V3.05 or Above

CONFigure:POWer:MIOutput:OQPSk:CONTrol:IMPairments[?] Impairments
CONFigure:POWer:MIOutput:HPSK:CONTrol:IMPairments[?]
<AWGN Level>, <BS Freq Offset>

<AWGN Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB | DEFault | MINimum | MAXimum | OFF,	AWGN level Default value Sets the value to the range minimum Sets the value to the range maximum AWGN off	OFF	dB	
<BS Freq Offset>	Description of parameters	Def. value	Def. unit	Unit ring
–50.0 kHz to +50.0 kHz | DEFault | MINimum | MAXimum | OFF	BS frequency offset Default value Sets the value to the range minimum Sets the value to the range maximum No offset	OFF	kHz	

Description of command	Sig. State	FW vers.
This command determines an Additional White Gaussian Noise level and a frequency offset to impair the CMU output signal.	All	V3.05 or Above

Subsystem POWer:MIOutput:LIMit

The subsystem *POWer:MIOutput:LIMit* defines the tolerance values for the minimum output measurement. The subsystem corresponds to the *Minimum Power* section in the *Limits* tab of the *Power Configuration* popup menu.

> ***Note:*** *The modulation scheme reference O-QPSK is omitted from the commands to remain compatible with cdmaOne. The modulation scheme reference H-PSK contains the type in the command. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

Minimum Output Limits

CONFigure:POWer:MIOutput[:OQPSk]:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?]
CONFigure:POWer:MIOutput:HPSK:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?]
<Absolute Min Power>, <Waveform Quality>

<Absolute Min Power>	Description of parameters	Def. value	Def. unit	Unit ring
–128.0 dBm to 0.0 dBm,	Upper limit for absolute min. power	–50	dBm	
<Waveform Quality>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to 1.0	Lower limit for waveform quality	0.944	–	

Description of command	Sig. State	FW vers.
This commands defines the tolerance limits for the minimum output measurement. The limits apply to all measurement curves *(Current, Average, Minimum, Maximum)*.	All	V3.05 or Above

Limits Default Settings

DEFault:POWer:MIOutput[:OQPSk]:LIMit[?]
DEFault:POWer:MIOutput:HPSK:LIMit[?]

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from their default values (partially or totally)	ON	–	

Description of command	Sig. State	FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem POWer:MIOutput:LIMit to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	All	V3.05 or Above

Measured Values – Subsystem POWer:MIOutput

The subsystem *POWer:MIOutput* determines and outputs the results of the *Minimum Output* measurement. They correspond to the measurement menu *Power*, application *Minimum Output,* with its various display elements.

> ***Note:*** *The modulation scheme reference O-QPSK is omitted from the commands to remain compatible with cdmaOne. The modulation scheme reference H-PSK contains the type in the command. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

	Scalar results:
READ[:SCALar]:POWer:MIOutput[:OQPSk]?	Start single shot measurement and return results
FETCh[:SCALar]:POWer:MIOutput[:OQPSk]?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:MIOutput[:OQPSk]?	Read out measurement results (synchronized)
READ[:SCALar]:POWer:MIOutput:HPSK?	Start single shot measurement and return results
FETCh[:SCALar]:POWer:MIOutput:HPSK?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:MIOutput:HPSK?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
Total Power Current,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Total Power Average,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Total Power Minimum,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Total Power Maximum,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Waveform Quality Current,	0.0 to 1.0	NAN	–	
Waveform Quality Average,	0.0 to 1.0	NAN	–	
Waveform Quality Minimum,	0.0 to 1.0	NAN	–	
Waveform Quality Maximum,	0.0 to 1.0	NAN	–	
Measurements out of Tolerance	0.0% to 100.0%	NAN	%	

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results.	All	V3.05 or Above

	Limit Matching
CALCulate[:SCALar]:POWer:MIOutput[:OQPSk]:MATChing:LIMit?	
CALCulate[:SCALar]:POWer:MIOutput:HPSK:MATChing:LIMit?	

Returned values	Value range	Def. value	Def. unit	Unit ring
Total Power Current,		INV	–	
Total Power Average,	For all values	INV	–	
Total Power Minimum,		INV	–	
Total Power Maximum,	NMAU | NMAL | INV | OK	INV	–	
Waveform Quality Current,		INV	–	
Waveform Quality Average,		INV	–	
Waveform Quality Minimum,		INV	–	
Waveform Quality Maximum		INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit lines have been exceeded. The following messages may be generated:	All	V3.05 or Above

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

Test Object POWer:MAOutput

The subsystem *POWer:MAOutput* measures the MS maximum output power. The subsystem corresponds to the measurement menu *Power*, application *Maximum Output*, and the sections related to this application in the associated popup menu *Power Configuration*.

Control of measurement – Subsystem POWer:MAOutput

The subsystem *POWer:MAOutput* controls the maximum output measurement.

> ***Note:*** *The modulation scheme reference O-QPSK is omitted from the commands to remain compatible with cdmaOne. The modulation scheme reference H-PSK contains the type in the command. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:POWer:MAOutput[:OQPSk]	Start new measurement	⇒ *RUN*
ABORt:POWer:MAOutput[:OQPSk]	Abort running measurement and switch off	⇒ *OFF*
STOP:POWer:MAOutput	**[:OQPSk]**Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:POWer:MAOutput[:OQPSk]	Next measurement step (*stepping mode*)	⇒ *RUN*
INITiate:POWer:MAOutput:HPSK	Start new measurement	⇒ *RUN*
ABORt:POWer:MAOutput:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:POWer:MAOutput:HPSK	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:POWer:MAOutput:HPSK	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.	All	V3.05 or Above

CONFigure:POWer:MAOutput[:OQPSk]:EREPorting[?] Event Reporting
CONFigure:POWer:MAOutput:HPSK:EREPorting[?]
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF | DEFault	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	

Description of command	Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All	V3.05 or Above

FETCh[:SCALar]:POWer:MAOutput[:OQPSk]:STATus? **FETCh[:SCALar]:POWer:MAOutput:HPSK:STATus?**		Measurement Status		
Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	–
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).			All	V3.05 or Above

Subsystem POWer:MAOutput:CONTrol

The subsystem *POWer:MAOutput:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs in the popup menu *Power Configuration.*

> ***Note:*** *The modulation scheme reference O-QPSK is omitted from the commands to remain compatible with cdmaOne. The modulation scheme reference H-PSK contains the type in the command. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:POWer:MAOutput[:OQPSk]:CONTrol[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol[?]
<Statistic Count>, <Repetition>, <Stop Cond>, <Step Mode>

Scope of Measurement

<Statistic Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
CONTuous |	Continuous measurement (until `STOP` or `ABORT`)			
SINGleshot|	Single shot measurement (until `Status = RDY`)			
DEFault,				
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,				
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE |	Continue measurement according to its rep. mode			
DEFault				

Description of command	Sig. State	FW-Vers.
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.	All	V3.05 or Above

CONFigure:POWer:MAOutput[:OQPSk]:CONTrol:STATistics[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol:STATistics[?]
<Statistic Count >

Scope of Measurement

<Statistic Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	

Description of command	Sig. State	FW-Vers.
This command specifies the number of bursts forming a statistics cycle.		V3.05 or Above

CONFigure:POWer:MAOutput[:OQPSk]:CONTrol:REPetition[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>

Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
CONTuous |	Continuous measurement (until `STOP` or `ABORT`)			
SINGleshot|	Single shot measurement (until `Status = RDY`)			
DEFault,				
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,				
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE |	Continue measurement according to its rep. mode			
DEFault				

Description of command	Sig. State	FW vers.
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All	V3.05 or Above

DEFault:POWer:MAOutput[:OQPSk]:CONTrol[?]
DEFault:POWer:MAOutput:HPSK:CONTrol[?]

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	The parameters differ from their default values (partially or totally)			

Description of command	Sig. State	FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem POWer:MAOutput:CONTrol to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	All	V3.05 or Above

Test Configuration

The commands of the following subsystems determine the parameters of the signal power measurement. They correspond to the different softkey/hotkey combinations in the graphical measurement menu and to the *Power Configuration* popup menu.

> ***Note:*** *The modulation scheme reference O-QPSK is omitted from the commands to remain compatible with cdmaOne. The modulation scheme reference H-PSK contains the type in the command. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:POWer:MAOutput[:OQPSk]:LEVel[?] CDMA Power
CONFigure:POWer:MAOutput:HPSK:LEVel[?]
<CDMA Power>, <FCH Level>, <Pilot Level>

<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm |	RF1 OUT , 0 dB ext. atten.	–104.0	dBm	
–120.0 dBm to –16.0 dBm |	RF2 OUT , 0 dB ext. atten.		dBm	
–100.0 dBm to +7.0 dBm	RF3 OUT , 0 dB ext. atten.		dBm	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum,	Sets the value to the range maximum			
<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward fundamental traffic channel level	–7.4	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum,	Sets the value to the range maximum			
<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward pilot level	–7.0	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum	Sets the value to the range maximum			

Description of command	Sig. State	FW vers.
This command determines the output signal levels of the CMU. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. The CDMA Power value range depends on the RF input used and the external attenuation set. It combines the commands `...:CONTrol:POWer:CDMA` and `...:CONTrol:LEVel`.	All	V3.05 or Above

CONFigure:POWer:MAOutput:OQPSk:CONTrol:POWer:CDMA[?] CDMA Levels
CONFigure:POWer:MAOutput:HPSK:CONTrol:POWer:CDMA[?]
<CDMA Power>

<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm |	RF1 OUT , 0 dB ext. atten	–104.0	dBm	
–120.0 dBm to –16.0 dBm |	RF2 OUT , 0 dB ext. atten		dBm	
–100.0 dBm to +7.0 dBm |	RF4 OUT , 0 dB ext. atten		dBm	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum	Sets the value to the range maximum			

Description of command	Sig. State	FW vers.
This command determines the total CDMA output power (absolute value, in dBm) of the CMU. The CDMA Power value range depends on the RF input used and the external attenuation set.	All	V3.05 or Above

CONFigure:POWer:MAOutput:OQPSk:CONTrol:LEVel[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>

CDMA Levels

<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | DEFault | MINimum | MAXimum,	Forward fundamental traffic channel level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–7.4	dB	
<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | DEFault | MINimum | MAXimum	Forward pilot level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–7.0	dB	

Description of command	Sig. State	FW vers.
This command determines the levels in the forward traffic channel and the forward pilot channel of the CMU. The individual channel powers are in units relative to the total CDMA power.	All	V3.05 or Above

CONFigure:POWer:MAOutput:OQPSk:CONTrol:IMPairments[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol:IMPairments[?]
<AWGN Level>, <BS Freq Offset>

Impairments

<AWGN Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB | DEFault | MINimum | MAXimum | OFF,	AWGN level Default value Sets the value to the range minimum Sets the value to the range maximum AWGN off	OFF	dB	
<BS Freq Offset>	Description of parameters	Def. value	Def. unit	Unit ring
–50.0 kHz to +50.0 kHz | DEFault | MINimum | MAXimum | OFF	BS frequency offset Default value Sets the value to the range minimum Sets the value to the range maximum No offset	OFF	kHz	

Description of command	Sig. State	FW vers.
This command determines an Additional White Gaussian Noise level and a frequency offset to impair the CMU output signal.	All	V3.05 or Above

Subsystem POWer:MAOutput:LIMit

The subsystem *POWer:MAOutput:LIMit* defines the tolerance values for the maximum output measurement. The subsystem corresponds to the *Maximum Output* section in the *Limits* tab of the *Power Configuration* popup menu.

***Note:** The modulation scheme reference O-QPSK is omitted from the commands to remain compatible with cdmaOne. The modulation scheme reference H-PSK contains the type in the command. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

Output Limits

CONFigure:POWer:MAOutput[:OQPSk]:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?]
CONFigure:POWer:MAOutput:HPSK:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?]
<Absolute Max Power>, <Upper Limit>, <Lower Limit>, <Waveform Quality>

<Absolute Max Power>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 dBm to +128.0 dBm	Absolute maximum power	23.0	dBm	
<Upper Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–128.0 dBm to +128.0 dBm	Upper limit for maximum power	7.0	dB	
<Lower Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–128.0 dBm to +128.0 dBm	Lower limit for maximum power	0.0	dBm	
<Waveform Quality>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to 1.0	Lower limit for waveform quality	0.944	–	
Description of command			Sig. State	FW vers.
This commands defines the tolerance limits for the maximum output measurement. The limits apply to all measurement curves *(Current, Average, Minimum, Maximum)*.			All	V3.05 or Above

Default Settings

DEFault:POWer:MAOutput[:OQPSk]:LIMit[?]
DEFault:POWer:MAOutput:HPSK:LIMit[?]
<Enable>

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	the parameters are set to their default values The parameters differ from their default values (partially or totally)	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem POWer:MAOutput:LIMit to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.			All	V3.05 or Above

Measured Values – Subsystem POWer

The subsystem *POWer:MAOutput* determines and outputs the results of the *Maximum Output* measurement. They correspond to the measurement menu *Power*, application *Maximum Output,* with its various display elements.

> ***Note:*** *The modulation scheme reference O-QPSK is omitted from the commands to remain compatible with cdmaOne. The modulation scheme reference H-PSK contains the type in the command. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

	Scalar results:
READ[:SCALar]:POWer:MAOutput[:OQPSk]?	Start single shot measurement and return results
FETCh[:SCALar]:POWer:MAOutput[:OQPSk]?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:MAOutput[:OQPSk]?	Read out measurement results (synchronized)
READ[:SCALar]:POWer:MAOutput:HPSK?	Start single shot measurement and return results
FETCh[:SCALar]:POWer:MAOutput:HPSK?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:MAOutput:HPSK?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
Total Power Current,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Total Power Average,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Total Power Minimum,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Total Power Maximum,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Waveform Quality Current,	0.0 to 1.0	NAN	–	
Waveform Quality Average,	0.0 to 1.0	NAN	–	
Waveform Quality Minimum,	0.0 to 1.0	NAN	–	
Waveform Quality Maximum,	0.0 to 1.0	NAN	–	
Meas. out of Tolerance	0.0% to 100.0%	NAN	%	

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results.	All	V3.05 or Above

	Limit Matching
CALCulate[:SCALar]:POWer:MAOutput[:OQPSk]:MATChing:LIMit?	
CALCulate[:SCALar]:POWer:MAOutput:HPSK:MATChing:LIMit?	

Returned values	Value range	Def. value	Def. unit	Unit ring
Total Power Current,		INV	–	
Total Power Average,	For all values	INV	–	
Total Power Minimum,		INV	–	
Total Power Maximum,	NMAU | NMAL | INV | OK	INV	–	
Waveform Quality Current,		INV	–	
Waveform Quality Average,		INV	–	
Waveform Quality Minimum,		INV	–	
Waveform Quality Maximum		INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit lines have been exceeded. The following messages may be generated*:*	All	V3.05 or Above

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

Test Object POWer:GOUTput

The subsystem *POWer:GOUTput* measures the MS gated output power. The subsystem corresponds to the measurement menu *Power,* application *Gated Output,* and the sections related to this application in the associated popup menu *Power Configuration.*

> **Note:** *To ensure that the mobile station's output signal is gated, establish a connection with Reverse Radio Configuration 1 or 2.*

Control of measurement – Subsystem POWer:GOUTput

The subsystem *POWer:GOUTput* controls the gated output measurement.

INITiate:POWer:GOUTput	Start new measurement	⇒ *RUN*
ABORt:POWer:GOUTput	Abort running measurement and switch off	⇒ *OFF*
STOP:POWer:GOUTput	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:POWer:GOUTput	Next measurement step (*stepping mode*)	⇒ *RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.		V3.05 or Above

CONFigure:POWer:GOUTput:EREPorting *<Report Mode>*				Event Reporting
<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF | DEFault	Service request Single operation complete SRQ and SOPC No reporting Sets the value to the default setting	OFF	–	
Description of command			Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).			All	V3.05 or Above

FETCh[:SCALar]:POWer:GOUTput:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	–
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).			All	V3.05 or Above

Subsystem POWer:GOUTput:CONTrol

The subsystem *POWer:GOUTput:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* tab in the popup menu *Power Configuration.*

CONFigure:POWer:GOUTput:CONTrol[?] ***<Result Mode>, <Statistic Count>, <Repetition>, <Stop Cond>, <Step Mode>***				Scope of Measurement
<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
<Statistic Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 | CONTuous | SINGleshot| DEFault,	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	
Description of command			Sig. State	FW-Vers.
This command combines the ...CONTrol:RMODe, ...CONTrol:STATistics and ...CONTrol:REPetition commands, see below.			All	V3.05 or Above

CONFigure:POWer:GOUTput:CONTrol:RMODe[?] ***<Result Mode>***				Result Mode
<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
Description of command			Sig. State	FW-Vers.
This command specifies the type of measured values.			All	V3.05 or Above

CONFigure:POWer:GOUTput:CONTrol:STATistics[?] ***<Statistics>***				Statistic Count
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	
Description of command				FW-Vers.
This command specifies the number of bursts forming a statistics cycle.			All	V3.05 or Above

CONFigure:POWer:GOUTput:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot|	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All	V3.05 or Above

CONFigure:POWer:GOUTput:CONTrol:PCGcount[?] Power Control Groups
<PCG Count>

<PCG Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 200	Power Control Groups	100	–	

Description of command	Sig. State	FW vers.
This command determines how many power control groups are used for a single trace in the Gated Output measurement.	All	V3.05 or Above

DEFault:POWer:GOUTput:CONTrol[?] Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	The parameters differ from their default values (partially or totally)			

Description of command	Sig. State	FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem POWer:GOUTput:CONTrol to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	All	V3.05 or Above

Test Configuration

The commands of the following subsystems determine the parameters of the signal power measurement. They correspond to the different softkey/hotkey combinations in the graphical measurement menu and to the *Power Configuration* popup menu.

CONFigure:POWer:GOUTput:LEVel[?] CDMA Levels
<CDMA Power>, <FCH Level>, <Pilot Level>

<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100 dBm to 7.0 dBm | DEFault | MINimum | MAXimum,	RF1 OUT , 0 dB ext. atten | RF2 OUT , 0 dB ext. atten | RF3 OUT , 0 dB ext. atten, Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–50.0	dBm	
<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
20.0 dB to –7.0 dB | DEFault | MINimum | MAXimum,	Forward fundamental traffic channel level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–7.4	dB	
<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | DEFault | MINimum | MAXimum	Forward pilot level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–7.0	dB	
Description of command			Sig. State	FW vers.
This command determines the output signal levels the CMU uses in the Gated Output measurement. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set. It combines the commands `...:CONTrol:POWer:CDMA` and `...:CONTrol:LEVel`.			All	V3.05 or Above

CONFigure:POWer:GOUTput:CONTrol:POWer:CDMA[?] CDMA Levels
<CDMA Power>

<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to +7.0 dBm | DEFault | MINimum | MAXimum	RF1 OUT , 0 dB ext. atten | RF2 OUT , 0 dB ext. atten | RF3 OUT , 0 dB ext. atten, Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–50.0	dBm	
Description of command			Sig. State	FW vers.
This command determines the total CDMA output power (absolute value, in dBm) the CMU uses in the Gated Output measurement. The CDMA Power value range depends on the RF input used and the external attenuation set.			All	V3.05 or Above

CONFigure:POWer:GOUTput:CONTrol:LEVel[?] ***<FCH Level>, <Pilot Level>***				CDMA Levels
<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
20.0 dB to –7.0 dB | DEFault | MINimum | MAXimum,	Forward fundamental traffic channel level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–7.4	dB	
<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | DEFault | MINimum | MAXimum	Forward pilot level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–7.0	dB	
Description of command			Sig. State	FW vers.
This command determines the levels in the forward traffic channel and the forward pilot channel the CMU uses in the Gated Output measurement. The individual channel powers are in units relative to the total CDMA power.			All	V3.05 or Above

CONFigure:POWer:GOUTput:CONTrol:IMPairments[?] ***<AWGN Level>, <BS Freq Offset>***				Impairments
<AWGN Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB | DEFault | MINimum | MAXimum | OFF,	AWGN level Default value Sets the value to the range minimum Sets the value to the range maximum AWGN off	OFF	dB	
<BS Freq Offset>	Description of parameters	Def. value	Def. unit	Unit ring
–50.0 kHz to +50.0 kHz | DEFault | MINimum | MAXimum | OFF	BS frequency offset Default value Sets the value to the range minimum Sets the value to the range maximum No offset	OFF	kHz	
Description of command			Sig. State	FW vers.
This command determines an Additional White Gaussian Noise level and a frequency offset to impair the CMU output signal.			All	V3.05 or Above

Subsystem POWer:GOUTput:LIMit

The subsystem *POWer:GOUTput:LIMit* defines the tolerance values for the gated output measurement. The subsystem corresponds to the *Limits* tab of the *Power Configuration* popup menu.

DEFault:POWer:GOUTput:LIMit[?]				Limits Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem POWer:GOUTput:LIMit to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*			All	V3.05 or Above

Subsystem SUBarrays:POWer:GOUTput

The subsystem *SUBarrays:POWer:GOUTput* defines the measurement range and the type of output values.

CONFigure:SUBarrays:POWer:GOUTput[?] **<Mode>, <Start>, <Samples>**				Definition of Subarrays
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | ARIThmetical | MINimum | MAXimum,	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
–100 µs to 1400 µs,	Start time in current range	NAN	s	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 1664	Number of samples in range	NAN	–	
Description of command			Sig. State	FW vers.
This command configures the `READ:SUBarrays:POWer:GOUTput...`, `FETCh:SUBarrays:POWer:GOUTput...`, `SAMPle:SUBarrays:POWer:GOUTput...` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by a start time and the number of test points which are located on a fixed, equidistant grid. The subranges may overlap but must be within the total range of the *POWer:GOUTput* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values.			All	V3.05 or Above

Measured Values – Subsystem POWer:GOUTput

The subsystem *POWer:GOUTput* determines and outputs the results of the *Gated Output* measurement. They correspond to the graphical measurement menu *Power*, application *Gated Output,* with its various display elements.

Scalar results

READ[:SCALar]:POWer:GOUTput?	Start single shot measurement and return results
FETCh[:SCALar]:POWer:GOUTput?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:GOUTput?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
Mean Output,	0.0 dBm to +100.0 dBm	NAN	dBm	
Out Of Tolerance,	0.0% to 100%	NAN	%	
Limit Lines Matching	NMAU | NMAL | INV | OK	INV	–	

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results.	All	V3.05 or Above

Burst Power

READ:ARRays:POWer:GOUTput:CURRent?
READ:ARRays:POWer:GOUTput:AVERage?
READ:ARRays:POWer:GOUTput:MINimum?
READ:ARRays:POWer:GOUTput:MAXimum?

Start single shot measurement and return results ⇒ *RUN*

FETCh:ARRays:POWer:GOUTput:CURRent?
FETCh:ARRays:POWer:GOUTput:AVERage?
FETCh:ARRays:POWer:GOUTput:MINimum?
FETCh:ARRays:POWer:GOUTput:MAXimum?

Read measurement results (unsynchronized) ⇒ *RUN*

SAMPle:ARRays:POWer:GOUTput:CURRent?
SAMPle:ARRays:POWer:GOUTput:AVERage?
SAMPle:ARRays:POWer:GOUTput:MINimum?
SAMPle:ARRays:POWer:GOUTput:MAXimum?

Read measurement results (synchronized) ⇒ *RUN*

Returned values	Value range	Def. value	Def. unit	Unit ring
BurstPower[1] (1st value for burst power),	–100.0 dB... + 10.0 dB,	NAN	dB	
BurstPower[x] (xth value for burst power)	–100.0 dB... + 10.0 dB	NAN	dB	

Description of command	Sig. State	FW vers.
These commands are always queries. They output the burst power versus time at fixed, equidistant test points. The number of measured values is 1664. The measured power is evaluated with 64 chips (i.e. 52 µs) before and after the actual isolated Power Control Group (PCG). Considering an oversampling factor of 1, a total of 64 + 1536 + 64 = 1664 valid samples is returned.	All	V3.05 or Above

Burst Power

READ:SUBarrays:POWer:GOUTput:CURRent?
READ:SUBarrays:POWer:GOUTput:AVERage?
READ:SUBarrays:POWer:GOUTput:MINimum?
READ:SUBarrays:POWer:GOUTput:MAXimum?

Start single shot measurement and return results ⇒ *RUN*

FETCh:SUBarrays:POWer:GOUTput:CURRent?
FETCh:SUBarrays:POWer:GOUTput:AVERage?
FETCh:SUBarrays:POWer:GOUTput:MINimum?
FETCh:SUBarrays:POWer:GOUTput:MAXimum?

Read measurement results (unsynchronized) ⇒ *RUN*

SAMPle:SUBarrays:POWer:GOUTput:CURRent?
SAMPle:SUBarrays:POWer:GOUTput:AVERage?
SAMPle:SUBarrays:POWer:GOUTput:MINimum?
SAMPle:SUBarrays:POWer:GOUTput:MAXimum?

Read measurement results (synchronized) ⇒ *RUN*

Measured values	Description	Def. value	Def. unit	Unit ring
BurstPower[1], 1st value for burst power	–100.0 dB... + 10.0 dB,	NAN	dB	
BurstPower[x], xth value for burst power	–100.0 dB... + 10.0 dB	NAN	dB	

Description of command	Sig. State	FW vers.
These commands are always queries. They output the burst power versus time in the subranges defined by means of the `CONFigure:SUBarrays:POWer:GOUTput` command. The `CONFigure:SUBarrays:POWer:GOUTput` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned per subrange. The calculation of *current, average, minimum,* and *maximum* results is explained in Chapter 3 (see *display mode*).	All	V3.05 or Above

CALCulate[:SCALar]:POWer:GOUTput:MATChing:RAMP?

Returned values	Description	Def. value	Def. unit	Unit ring
Total Ramp Status	NMAU | NMAL | INV | OK	INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit lines have been exceeded. The following messages may be generated:	All	V3.05 or Above

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

<table>
<tr><td colspan="4">CALCulate:ARRay:POWer:GOUTput:MATChing:LIMit?</td><td>Limit Matching</td></tr>
<tr><td>Returned values</td><td>Description</td><td>Def. value</td><td>Def. unit</td><td>Unit ring</td></tr>
<tr><td>Bit Field Upper Limits,
Bit Field Lower Limits</td><td>For all values
NMAU | NMAL | INV | OK</td><td>INV</td><td>–
–</td><td></td></tr>
<tr><td colspan="3">Description of command</td><td>Sig. State</td><td>FW vers.</td></tr>
<tr><td colspan="3">This command is always a query. It indicates whether and in which way the tolerances for the scalar measured values have been exceeded.
The following messages may be generated:
NMAU Tolerance value underflow <i>not matching, underflow</i>
NMAL Tolerance value exceeded <i>not matching, overflow</i>
INV Measurement invalid <i>invalid</i>
OK Tolerance value matched</td><td>All</td><td>V3.05 or Above</td></tr>
</table>

Test Object CDPower

The subsystem *CDPower* measures the Code Domain Power. The subsystem corresponds to the measurement menu *CDPower* and the sections related to this application in the associated popup menu *Code Domain Power Configuration.*

CONFigure:CDPower:CPCCommon:LEVel[?] ***<CDMA Power>*, *<FCH Level>*, *<Pilot Level>***				Levels
<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to +7.0 dBm | DEFault | MINimum | MAXimum,	RF1 OUT, 0 dB ext. atten | RF2 OUT, 0 dB ext. atten | RF3 OUT, 0 dB ext. atten Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–50.0	dBm	
<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dBm to –7.0 dBm | DEFault | MINimum | MAXimum,	Forward fundamental traffic channel level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–7.4	–	
<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dBm to –7.0 dBm | DEFault | MINimum | MAXimum,	Forward pilot level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–7.0	–	
Description of command			Sig. State	FW vers.
This command determines the output signal levels the CMU uses in the Code Domain Power measurement. It combines the commands `...CDPower:CPCCommon:CONTrol:POWer:CDMA` and `...CDPower:CPCCommon:CONTrol:LEVel`.			All	V3.05 or Above

CONFigure:CDPower:CPCCommon:CONTrol:POWer:CDMA[?] ***<CDMA Power>***				Levels
<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to +7.0 dBm | DEFault | MINimum | MAXimum	RF1 OUT, 0 dB ext. atten | RF2 OUT, 0 dB ext. atten | RF3 OUT, 0 dB ext. atten Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–50.0	dBm	
Description of command			Sig. State	FW vers.
This command determines the total CDMA output power (absolute value, in dBm) the CMU uses in the Code Domain Power measurement. The CDMA Power value range depends on the RF input used and the external attenuation set.			All	V3.05 or Above

CONFigure:CDPower:CPCCommon:CONTrol:LEVel[?] ***<FCH Level>, <Pilot Level>***				Levels
<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dBm to –7.0 dBm | DEFault | MINimum | MAXimum,	Forward fundamental traffic channel level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–7.4	–	
<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dBm to –7.0 dBm | DEFault | MINimum | MAXimum,	Forward pilot level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–7.0	–	
Description of command			Sig. State	FW vers.
This command determines the the fundamental and supplemental traffic channels and the forward pilot channel the CMU uses in the Code Domain Power measurement. The individual channel powers are in units relative to the total CDMA power.			All	V3.05 or Above

CONFigure:CDPower:CPCCommon:IMPairments[?] ***<AWGN Level>, <BS Freq Offset>***				Impairments
<AWGN Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB | DEFault | MINimum | MAXimum | OFF,	AWGN level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	dB	
<BS Freq Offset>	Description of parameters	Def. value	Def. unit	Unit ring
–50.0 kHz to +50.0 kHz | DEFault | MINimum | MAXimum | OFF	BS frequency offset Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	kHz	
Description of command			Sig. State	FW vers.
This command determines an Additional White Gaussian Noise level and a frequency offset to impair the CMU output signal.			All	V3.05 or Above

DEFault:CDPower:CPCCommon:CONTrol[?] ***<Default All Settings>***				Default All Settings
<Default All Settings>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Sets all CDP parameters to default values	OFF	–	
Description of command			Sig. State	FW vers.
This command sets all common control parameters for the Code Domain Power measurement to their default values.			All	V3.05 or Above

CONFigure:CDPower:CPCCommon:CMAX:LIMit:ASYMmetric[:COMBined][?] **<Carrier Feedthrough Limit>, <Freq Error Limit>, <Rho Limit>**				Limits
<Carrier Feedthrough Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 to –20.0 | DEFault | MINimum | MAXimum | OFF,	Carrier feedthrough limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–40.0	dB	
<Freq Error Limit>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 1000.0 Hz | DEFault | MINimum | MAXimum | OFF,	Carrier frequency error limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	300.0	Hz	
<Rho Limit>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to 1.0 | DEFault | MINimum | MAXimum | OFF	Correlated power to the total power ratio limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	0.944	–	
Description of command			Sig. State	FW vers.
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.			All	V3.05 or Above

CONFigure:CDPower:CPCCommon:AVERage:LIMit:ASYMmetric[:COMBined][?] **<Carrier Feedthrough Limit Average>, <Freq Error Limit Average>, <Rho Limit Average>**				Limits
<Carrier Feedthrough Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 to –20.0 | DEFault | MINimum | MAXimum | OFF,	Carrier feedthrough limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–40.0	dB	
<Freq Error Limit>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 1000.0 Hz | DEFault | MINimum | MAXimum | OFF,	Carrier frequency error limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	300.0	Hz	
<Rho Limit>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to 1.0 | DEFault | MINimum | MAXimum | OFF	Correlated power to the total power ratio limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	0.944	–	
Description of command			Sig. State	FW vers.
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.			All	V3.05 or Above

Control of measurement – Subsystem CDPower:CDPW

The subsystem *CDPower:CDPW* measures the MS Code Domain Power output. The subsystem corresponds to the measurement menu *Code Domain Power*, application *CDP*, and the sections related to this application in the associated popup menu *Code Domain Power Configuration*.

INITiate:CDPower:CDPW	Start new measurement	⇒ *RUN*
ABORt:CDPower:CDPW	Abort running measurement and switch off	⇒ *OFF*
STOP:CDPower:CDPW	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:CDPower:CDPW	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.	All	V3.05 or Above

CONFigure:CDPower:CDPW:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
DEFault |	Sets the value to the default setting			
OFF	No reporting			

Description of command	Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All	V3.05 or Above

CONFigure:CDPower:CDPW:CMAX:LIMit:ASYMmetric[:COMBined][?] Limits
<CDP Limit Y>

<CDP Limit Y>	Description of parameters	Def. value	Def. unit	Unit ring
–60.0 to 0 |	Peak code domain power Y limit	–23.0	dB	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault |	Sets the value to the default setting			
OFF				

Description of command	Sig. State	FW vers.
This command defines the upper limit for the code domain power. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.	All	V3.05 or Above

CONFigure:CDPower:CDPW:AVERage:LIMit:ASYMmetric[:COMBined][?] <CDP Limit Y Average>				Limits
<CDP Limit Y>	Description of parameters	Def. value	Def. unit	Unit ring
–60.0 to 0 | MINimum | MAXimum | DEFault | OFF	Peak code domain power Y limit Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	–23.0	dB	
Description of command			Sig. State	FW vers.
This command defines the upper limit for the code domain power. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.			All	V3.05 or Above

CALCulate[:SCALar]:CDPower:CDPW:MATChing:LIMIt?				Limit Matching
Returned values	Value range	Def. value	Def. unit	Unit ring
CDP Carrier Feedthrough, CDP Frequency Error, CDP Rho	For all values NMAU | NMAL | INV | OK	INV INV INV	– – –	
Description of command			Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated: NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched			All	V3.05 or Above

CALCulate:ARRay:CDPower:CDPW:ISIGnal:CURRent[:RESult]:MATChing:LIMit?				I Signal Tolerance
Returned value	Description	Def. value	Def. unit	Unit ring
I signal tolerance	NMAU | NMAL | INV | OK	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated: NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched			All	V3.05 or Above

CALCulate:ARRay:CDPower:CDPW:ISIGnal:AVERage[:RESult]:MATChing:LIMit?				I Signal Tolerance
Returned value	Description	Def. value	Def. unit	Unit ring
I signal tolerance	NMAU | NMAL | INV | OK	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated: NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched			All	V3.05 or Above

CALCulate:ARRay:CDPower:CDPW:ISIGnal:MAXimum[:RESult]:MATChing:LIMit? I Signal Tolerance

Returned value	Description	Def. value	Def. unit	Unit ring
I signal tolerance	NMAU | NMAL | INV | OK	INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated:	All	V3.05 or Above

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

CALCulate:ARRay:CDPower:CDPW:QSIGnal:CURRent[:RESult]:MATChing:LIMit? Q Signal Tolerance

Returned value	Description	Def. value	Def. unit	Unit ring
Q signal tolerance	NMAU | NMAL | INV | OK	INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated:	All	V3.05 or Above

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

CALCulate:ARRay:CDPower:CDPW:QSIGnal:AVERage[:RESult]:MATChing:LIMit? Q Signal Tolerance

Returned value	Description	Def. value	Def. unit	Unit ring
Q signal tolerance	NMAU | NMAL | INV | OK	INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated:	All	V3.05 or Above

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

CALCulate:ARRay:CDPower:CDPW:QSIGnal:MAXimum[:RESult]:MATChing:LIMit? Q Signal Tolerance

Returned value	Description	Def. value	Def. unit	Unit ring
Q signal tolerance	NMAU | NMAL | INV | OK	INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated:	All	V3.05 or Above

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

FETCh[:SCALar]:CDPower:CDPW:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	–
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	–
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	–
NONE	Statistic count set to off			
Description of command			Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).			All	V3.05 or Above

Subsystem CDPower:CDPW:CONTrol

The subsystem *CDPower:CDPW:CONTrol* defines the resultmode, repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* tab in the popup menu *Code Domain Power Configuration.*

CONFigure:CDPower:CDPW:CONTrol[?] ***<Result Mode>, <Current Statistics>, <Repetition>, <Stop Cond>, <Step Mode>***				Scope of Measurement
<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar |	Scalar values only (incl. ramp matching)	ARR	–	
ARRay,	Scalar measured values and arrays			
<Current Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (*counting*, until `Status = STEP | RDY)`	SING	–	
CONTuous |	Continuous measurement (until `STOP` or `ABORT)`			
SINGleshot|	Single shot measurement (until `Status = RDY)`			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			
Description of command			Sig. State	FW-Vers.
This command combines the `...CONTrol:RMODe`, `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.			All	V3.05 or Above

CONFigure:CDPower:CDPW:CONTrol:RMODe[?] Result mode
<Result Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	

Description of command	Sig. State	FW-Vers.
This command specifies the type of measured values.	All	V3.05 or Above

CONFigure:CDPower:CDPW:CONTrol:STATistics[?] Statistic Count
<Current Statistics >

<Current Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	

Description of command	Sig. State	FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.	All	V3.05 or Above

CONFigure:CDPower:CDPW:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
CONTuous |	Continuous measurement (until `STOP` or `ABORT`)			
SINGleshot|	Single shot measurement (until `Status = RDY`)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All	V3.05 or Above

CONFigure:CDPower:CDPW:CONTrol:RORDer[?] ***<Result Order>*** Result Order

<Result Order>	Description of parameters	Def. value	Def. unit	Unit ring
HADamard | BITReverse	Walsh code channels returned using Hadamard matrix Walsh code channels returned at MSB to LSB	HAD	–	

Description of command	Sig. State	FW-Vers.
This command defines the method used to display the code channels. HADamard displays the code channels in order determined by the Hadamard matrix. BITReverse displays the code channels so that the related code channels are adjacent to each other. This setting is only available for Code Domain and Peak Code Domain Error measurement applications.	All	V3.05 or Above

DEFault:CDPower:CDPW:CONTrol[?] Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from their default values (partially or totally)	ON	–	

Description of command	Sig. State	FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem CDPower:CDPW:CONTrol to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	All	V3.05 or Above

Measured Values – Subsystem CDPower:CDPW

The subsystem *CDPower:CDPW* determines and outputs the results of the Code Domain Power measurements.

I Signal Measurement

READ:ARRay:CDPower:CDPW:ISIGnal[:VALue]:CURRent?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:CDPW:ISIGnal[:VALue]:CURRent?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:CDPW:ISIGnal[:VALue]:CURRent?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in phase signal path (I-signal).	All	V3.05 or Above

I Signal Measurement

READ:ARRay:CDPower:CDPW:ISIGnal[:VALue]:AVERage?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:CDPW:ISIGnal[:VALue]:AVERage?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:CDPW:ISIGnal[:VALue]:AVERage?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in phase signal path (I-signal).	All	V3.05 or Above

I Signal Measurement

READ:ARRay:CDPower:CDPW:ISIGnal[:VALue]:MAXimum?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:CDPW:ISIGnal[:VALue]:MAXimum?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:CDPW:ISIGnal[:VALue]:MAXimum?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in phase signal path (I-signal).	All	V3.05 or Above

Q signal Measurement

READ:ARRay:CDPower:CDPW:QSIGnal[:VALue]:CURRent?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:CDPW:QSIGnal[:VALue]:CURRent?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:CDPW:QSIGnal[:VALue]:CURRent?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal).	All	V3.05 or Above

Q Signal Measurement

READ:ARRay:CDPower:CDPW:QSIGnal[:VALue]:AVERage?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:CDPW:QSIGnal[:VALue]:AVERage?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:CDPW:QSIGnal[:VALue]:AVERage?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal).	All	V3.05 or Above

Q Signal Measurement

READ:ARRay:CDPower:CDPW:QSIGnal[:VALue]:MAXimum?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:CDPW:QSIGnal[:VALue]:MAXimum?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:CDPW:QSIGnal[:VALue]:MAXimum?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal).	All	V3.05 or Above

Scalar results:

READ[:SCALar]:CDPower:CDPW?	Start single shot measurement and return results
FETCh[:SCALar]:CDPower:CDPW?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:CDPower:CDPW?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
MS Power (x3),	–100.0 dBm to –50.0 dBm	NAN	dBm	
Carrier Feedthrough (x3),	–120.0 dB to –20.0 dB	NAN	dB	
Frequency Error (x3),	0 to 1000.0 Hz	NAN	Hz	
Rho (x3),	0.0 to 1.0	NAN	–	
Out of Tolerance,	0.0% to 100.0%	NAN	–	
Current Statistics	1 to 10000	NAN	–	

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value.	All	V3.05 or Above

Test Object CDPower:PCDep

The subsystem *CDPower:PCDep* measures the MS Peak Code Domain Error Power output. The subsystem corresponds to the measurement menu *Code Domain Power*, application *PCDep*, and the sections related to this application in the associated popup menu *Code Domain Power Configuration*.

Control of measurement – Subsystem CDPower:PCDep

The subsystem *CDPower:PCDep* controls the maximum output measurement.

INITiate:CDPower:PCDep	Start new measurement	⇒ *RUN*
ABORt:CDPower:PCDep	Abort running measurement and switch off	⇒ *OFF*
STOP:CDPower:PCDep	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:CDPower:PCDep	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.	All	V3.05 or Above

CONFigure:CDPower:PCDep:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	

Description of command	Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All	V3.05 or Above

CONFigure:CDPower:PCDep:CMAX:LIMit:ASYMmetric[:COMBined][?] Limits
<CDP Limit Y>

<PCDep Limit Y>	Description of parameters	Def. value	Def. unit	Unit ring
–60.0 to 0 | DEFault | MINimum | MAXimum | OFF	Peak code domain error power limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–23.0	dB	

Description of command	Sig. State	FW vers.
This command defines the upper limit for the peak code domain error power. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.	All	V3.05 or Above

CONFigure:CDPower:PCDep:AVERage:LIMit:ASYMmetric[:COMBined][?] **<PCD Limit Y Average>**				Limits
<PCDep Limit Y>	Description of parameters	Def. value	Def. unit	Unit ring
–60.0 to 0 |	Peak code domain error power limit	–23.0	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF				
Description of command			Sig. State	FW vers.
This command defines the upper limit for the peak code domain error power. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.			All	V3.05 or Above

FETCh[:SCALar]:CDPower:PCDep:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	–
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	–
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	–
NONE	Statistic count set to off			
Description of command			Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).			All	V3.05 or Above

Subsystem CDPower:PCDep:CONTrol

The subsystem *CDPower:PCDep:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* tab in the popup menu *Code Domain Power Configuration.*

CONFigure:CDPower:PCDep:CONTrol[?] ***<Result Mode>*, *<Current Statistics>*, *<Repetition>*, *<Stop Cond>*, *<Step Mode>***				Scope of Measurement
<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
<Current Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 | CONTuous | SINGleshot| DEFault,	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	
Description of command			Sig. State	FW-Vers.
This command combines the `...CONTrol:RMODe`, `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.			All	V3.05 or Above

CONFigure:CDPower:PCDep:CONTrol:RMODe[?] ***<Result Mode>*** mode				Result Mode
<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
Description of command			Sig. State	FW-Vers.
This command specifies the type of measured values.			All	V3.05 or Above

CONFigure:CDPower:PCDep:CONTrol:RORDer[?] Result Order
<Result Order>

<Result Order>	Description of parameters	Def. value	Def. unit	Unit ring
HADamard | BITReverse	Walsh code channels returned using Hadamard matrix Walsh code channels returned at MSB to LSB	HAD	–	

Description of command	Sig. State	FW-Vers.
This command defines the method used to display the code channels. HADamard displays the code channels in order determined by the Hadamard matrix. BITReverse displays the code channels so that the related code channels are adjacent to each other. This setting is only available for Code Domain and Peak Code Domain Error measurement applications.	All	V3.05 or Above

CONFigure:CDPower:PCDep:CONTrol:STATistics[?] Statistic Count
<Current Statistics>

<Current Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	

Description of command	Sig. State	FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.	All	V3.05 or Above

CONFigure:CDPower:PCDep:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTuous | SINGleshot| DEFault,	Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	

Description of command	Sig. State	FW vers.
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All	V3.05 or Above

DEFault:CDPower:PCDep:CONTrol[?]				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from their default values (partially or totally)	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem CDPower:PCDep:CONTrol to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.			All	V3.05 or Above

Measured Values – Subsystem CDPower:PCDep

The subsystem *CDPower:PCDep* determines and outputs the results of the Code Domain Error Power. This is the difference between the ideal code domain power and the measured signal.

I Signal Measurement

READ:ARRay:CDPower:PCDep:ISIGnal:[VALue]:CURRent?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:PCDep:ISIGnal:[VALue]:CURRent?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:PCDep:ISIGnal:[VALue]:CURRent?
Read results (synchronized) ⇒ RUN

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		
Description of command			Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in-phase signal path (I-signal).			All	V3.05 or Above

I Signal Measurement

READ:ARRay:CDPower:PCDep:ISIGnal:[VALue]:AVERage?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:PCDep:ISIGnal:[VALue]:AVERage?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:PCDep:ISIGnal:[VALue]:AVERage?
Read results (synchronized) ⇒ RUN

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		
Description of command			Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in-phase signal path (I-signal).			All	V3.05 or Above

I Signal Measurement

READ:ARRay:CDPower:PCDep:ISIGnal:[VALue]:MAXimum?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:PCDep:ISIGnal:[VALue]:MAXimum?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:PCDep:ISIGnal:[VALue]:MAXimum?
Read results (synchronized) ⇒ RUN

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		
Description of command			Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in-phase signal path (I-signal).			All	V3.05 or Above

Q Signal Measurement

READ:ARRay:CDPower:PCDep:QSIGnal:[VALue]:CURRent?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:PCDep:QSIGnal:[VALue]:CURRent?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:PCDep:QSIGnal:[VALue]:CURRent?
Read results (synchronized) ⇒ RUN

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		
Description of command			Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal).			All	V3.05 or Above

Q Signal Measurement

READ:ARRay:CDPower:PCDep:QSIGnal:[VALue]:AVERage?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:PCDep:QSIGnal:[VALue]:AVERage?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:PCDep:QSIGnal:[VALue]:AVERage?
Read results (synchronized) ⇒ RUN

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		
Description of command			Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal).			All	V3.05 or Above

Q Signal Measurement

READ:ARRay:CDPower:PCDep:QSIGnal:[VALue]:MAXimum?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:PCDep:QSIGnal:[VALue]:MAXimum?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:PCDep:QSIGnal:[VALue]:MAXimum?
Read results (synchronized) ⇒ RUN

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal).	All	V3.05 or Above

Scalar results:

READ[:SCALar]:CDPower:PCDep? Start single shot measurement and return results
FETCh[:SCALar]:CDPower:PCDep? Read out measurement results (unsynchronized)
SAMPle[:SCALar]:CDPower:PCDep? Read out measurement results (synchronized)

Returned values	Description	Def. value	Def. unit	Unit ring
MS Power (x3),	–100.0 dBm to –50.0 dBm	NAN	dBm	
Carrier Feedthrough (x3),	–120.0 dB to –20.0 dB	NAN	dB	
Frequency Error (x3),	0 to 1000.0 Hz	NAN	Hz	
Rho (x3),	0.0 to 1.0	NAN	–	
Out of Tolerance,	0.0% to 100.0%	NAN	–	
Current Statistics	1 to 10000	NAN	–	

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value.	All	V3.05 or Above

CALCulate[:SCALar]:CDPower:PCDep:MATChing:LIMIt? Limit Matching

Returned values	Description	Def. value	Def. unit	Unit ring
PCDep Carrier Feedthrough,	For all values	NAN	–	
PCDep Frequency Error>,			–	
PCDep Rho	NMAU | NMAL | INV | OK		–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated:	All	V3.05 or Above

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

CALCulate:ARRay:CDPower:PCDep:ISIGnal:CURRent[:RESult]:MATChing:LIMit?				I Signal Tolerance
Returned value	Description	Def. value	Def. unit	Unit ring
I Signal Tolerance	NMAU | NMAL | INV | OK	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated: NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched			All	V3.05 or Above

CALCulate:ARRay:CDPower:PCDep:ISIGnal:AVERage[:RESult]:MATChing:LIMit?				I Signal Tolerance
Returned value	Description	Def. value	Def. unit	Unit ring
I Signal Tolerance	NMAU | NMAL | INV | OK	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated: NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched			All	V3.05 or Above

CALCulate:ARRay:CDPower:PCDep:ISIGnal:MAXimum[:RESult]:MATChing:LIMit?				I Signal Tolerance
Returned value	Description	Def. value	Def. unit	Unit ring
I Signal Tolerance	NMAU | NMAL | INV | OK	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated: NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched			All	V3.05 or Above

CALCulate:ARRay:CDPower:PCDep:QSIGnal:CURRent[:RESult]:MATChing:LIMit?				Q Signal Tolerance
Returned value	Description	Def. value	Def. unit	Unit ring
Q Signal Tolerance	NMAU | NMAL | INV | OK	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated: NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched			All	V3.05 or Above

<table>
<tr><td colspan="3">CALCulate:ARRay:CDPower:PCDep:QSIGnal:AVERage[:RESult]:MATChing:LIMit?</td><td colspan="2">Q Signal Tolerance</td></tr>
<tr><td>Returned value</td><td>Description</td><td>Def. value</td><td>Def. unit</td><td>Unit ring</td></tr>
<tr><td>Q Signal Tolerance</td><td>NMAU | NMAL | INV | OK</td><td>INV</td><td>–</td><td></td></tr>
<tr><td colspan="3">Description of command</td><td>Sig. State</td><td>FW vers.</td></tr>
<tr><td colspan="3">This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated:
NMAU Tolerance value underflow <i>not matching, underflow</i>
NMAL Tolerance value exceeded <i>not matching, overflow</i>
INV Measurement invalid <i>invalid</i>
OK Tolerance value matched</td><td>All</td><td>V3.05 or Above</td></tr>
</table>

<table>
<tr><td colspan="3">CALCulate:ARRay:CDPower:PCDep:QSIGnal:MAXimum[:RESult]:MATChing:LIMit?</td><td colspan="2">Q Signal Tolerance</td></tr>
<tr><td>Returned value</td><td>Description</td><td>Def. value</td><td>Def. unit</td><td>Unit ring</td></tr>
<tr><td>Q Signal Tolerance</td><td>NMAU | NMAL | INV | OK</td><td>INV</td><td>–</td><td></td></tr>
<tr><td colspan="3">Description of command</td><td>Sig. State</td><td>FW vers.</td></tr>
<tr><td colspan="3">This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The following messages may be generated:
NMAU Tolerance value underflow <i>not matching, underflow</i>
NMAL Tolerance value exceeded <i>not matching, overflow</i>
INV Measurement invalid <i>invalid</i>
OK Tolerance value matched</td><td>All</td><td>V3.05 or Above</td></tr>
</table>

Test Object CDPower:CHPW

The subsystem *CDPower:CHPW* measures the MS Channel Power output. The subsystem corresponds to the measurement menu *Code Domain Power*, application *Channel Power*, and the sections related to this application in the associated popup menu *Code Domain Power Configuration.*

Control of measurement – Subsystem CDPower:CHPW

The subsystem *CDPower:PCDep* controls the maximum output measurement.

<table>
<tr><td>INITiate:CDPower:CHPW</td><td>Start new measurement</td><td colspan="2">⇒ <i>RUN</i></td></tr>
<tr><td>ABORt:CDPower:CHPW</td><td>Abort running measurement and switch off</td><td colspan="2">⇒ <i>OFF</i></td></tr>
<tr><td>STOP:CDPower:CHPW</td><td>Stop measurement after current stat. cycle</td><td colspan="2">⇒ <i>STOP</i></td></tr>
<tr><td>CONTinue:CDPower:CHPW</td><td>Next measurement step (<i>stepping mode</i>)</td><td colspan="2">⇒ <i>RUN</i></td></tr>
<tr><td colspan="2">Description of command</td><td>Sig. State</td><td>FW vers.</td></tr>
<tr><td colspan="2">These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.</td><td>All</td><td>V3.05 or Above</td></tr>
</table>

CONFigure:CDPower:CHPW:EREPorting[?] ***<Report Mode>***				Event Reporting
<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			
Description of command			Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).			All	V3.05 or Above

CONFigure:CDPower:CHPW:CMAX:LIMit:ASYMmetric[:COMBined][?] **<CHPW Limit Y>**				Limits
<CHPW Limit Y>	Description of parameters	Def. value	Def. unit	Unit ring
–60.0 to 0 |	Channel power Y limit	–23.0	dB	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault |	Sets the value to the default setting			
OFF				
Description of command			Sig. State	FW vers.
This command defines the upper limit for the channel power (Y value). The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.			All	V3.05 or Above

CONFigure:CDPower:CHPW:AVERage:LIMit:ASYMmetric[:COMBined][?] **<CHPW Limit Y Average>**				Limits
<CHPW Limit Y Average>	Description of parameters	Def. value	Def. unit	Unit ring
–60.0 to 0 |	Channel power Y limit	–23.0	dB	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault |	Sets the value to the default setting			
OFF				
Description of command			Sig. State	FW vers.
This command defines the upper limit for the channel power (Y value). The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.			All	V3.05 or Above

CALCulate[:SCALar]:CDPower:CHPW:MATChing:LIMIt? Limit Matching

Returned values	Value range	Def. value	Def. unit	Unit ring
CHP Carrier Feedthrough,	For all values	INV	–	
CHP Frequency Error,		INV	–	
CHP Rho	NMAU | NMAL | INV | OK	INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit lines have been exceeded. The following messages may be generated:	All	V3.05 or Above

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

FETCh[:SCALar]:CDPower:CHPW:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	–
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	–
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	–
NONE	Statistic count set to off			

Description of command	Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	All	V3.05 or Above

Subsystem CDPower:CHPW:CONTrol

The subsystem *CDPower:CHPW:CONTrol* defines the result mode, repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* tab in the popup menu *Code Domain Power Configuration.*

CONFigure:CDPower:CHPW:CONTrol[?] Scope of Measurement
<Result Mode>, <Current Statistics>, <Repetition>, <Stop Cond>, <Step Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
<Current Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot|	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	

Description of command	Sig. State	FW-Vers.
This command combines the `...CONTrol:RMODe`, `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.	All	V3.05 or Above

CONFigure:CDPower:CHPW:CONTrol:RMODe[?] Result Mode
<Result Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	

Description of command	Sig. State	FW-Vers.
This command specifies the type of measured values.	All	V3.05 or Above

CONFigure:CDPower:CHPW:CONTrol:STATistics[?] Statistic Count
<Current Statistics >

<Current Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	

Description of command	Sig. State	FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.	All	V3.05 or Above

CONFigure:CDPower:CHPW:CONTrol:REPetition[?] ***<Repetition>, <Stop Cond>, <Step Mode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot|	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			
Description of command			Sig. State	FW vers.
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*			All	V3.05 or Above

DEFault:CDPower:CHPW:CONTrol[?]				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	The parameters differ from their default values (partially or totally)			
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem CDPower:CHPW:CONTrol to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.			All	V3.05 or Above

Measured Values – Subsystem CDPower:CHPW

The subsystem *CDPower:CHPW* determines and outputs the results of the Channel Power.

I Signal Measurement

READ:ARRay:CDPower:CHPW:ISIGnal:[VALue]:CURRent?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:CHPW:ISIGnal:[VALue]:CURRent?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:CHPW:ISIGnal:[VALue]:CURRent?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in-phase signal path (I-signal).	All	V3.05 or Above

I Signal Measurement

READ:ARRay:CDPower:CHPW:ISIGnal:[VALue]:AVERage?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:CHPW:ISIGnal:[VALue]:AVERage?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:CHPW:ISIGnal:[VALue]:AVERage?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in-phase signal path (I-signal).	All	V3.05 or Above

I Signal Measurement

READ:ARRay:CDPower:CHPW:ISIGnal:[VALue]:MAXimum?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:CHPW:ISIGnal:[VALue]:MAXimum?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:CHPW:ISIGnal:[VALue]:MAXimum?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in-phase signal path (I-signal).	All	V3.05 or Above

Q Signal Measurement

READ:ARRay:CDPower:CHPW:QSIGnal:[VALue]:CURRent?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:CHPW:QSIGnal:[VALue]:CURRent?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:CHPW:QSIGnal:[VALue]:CURRent?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal).	All	V3.05 or Above

Q Signal Measurement

READ:ARRay:CDPower:CHPW:QSIGnal:[VALue]:AVERage?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:CHPW:QSIGnal:[VALue]:AVERage?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:CHPW:QSIGnal:[VALue]:AVERage?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal).	All	V3.05 or Above

Q Signal Measurement

READ:ARRay:CDPower:CHPW:QSIGnal:[VALue]:MAXimum?
Start single shot measurement and return results ⇒ RUN
FETCh:ARRay:CDPower:CHPW:QSIGnal:[VALue]:MAXimum?
Read meas. results (unsynchronized) ⇒ RUN
SAMPle:ARRay:CDPower:CHPW:QSIGnal:[VALue]:MAXimum?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
Walsh code	W_0^{32} to W_{31}^{32}	NAN		

Description of command	Sig. State	FW vers.
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal).	All	V3.05 or Above

READ[:SCALar]:CDPower:CHPW? **FETCh[:SCALar]:CDPower:CHPW?** **SAMPle[:SCALar]:CDPower:CHPW?**	Scalar results: Start single shot measurement and return results Read out measurement results (unsynchronized) Read out measurement results (synchronized)			
Returned values	Value range	Def. value	Def. unit	Unit ring
MS Power (x3),	–100.0 dBm to –50.0 dBm	NAN	dBm	
Carrier Feedthrough (x3),	–120.0 dB to –20.0 dB	NAN	dB	
Frequency Error (x3),	0 to 1000.0 Hz	NAN	Hz	
Rho (x3),	0.0 to 1.0	NAN	–	
Out of Tolerance,	0.0% to 100.0%	NAN	%	
Current Statistics	1 to 10000	NAN	–	
Description of command			Sig. State	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value.			All	V3.05 or Above

Test Object MODulation:OVERview

The subsystem *MODulation:OVERview* measures general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation*, application *Overview*, and the associated popup menu *Modulation Configuration*.

Control of Measurement – Subsystem MODulation:OVERview

The subsystem *MODulation:OVERview* controls the modulation measurement. It corresponds to the softkey *Overview O-QPSK* (*H-PSK*) in the measurement menu *Modulation*.

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:MODulation:OVERview[:OQPSk]	Start new measurement	⇒ *RUN*
ABORt:MODulation:OVERview[:OQPSk]	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:OVERview	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:OVERview[:OQPSk]	Next measurement step (only *stepping mode*)	⇒ *RUN*
INITiate:MODulation:OVERview:HPSK	Start new measurement	⇒ *RUN*
ABORt:MODulation:OVERview:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:OVERview:HPSK	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:OVERview:HPSK	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.	All	V3.05 or Above

CONFigure:MODulation:OVERview[:OQPSk]:EREPorting[?] Event Reporting
CONFigure:MODulation:OVERview:HPSK:EREPorting[?]
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All	V3.05 or Above

FETCh:MODulation:OVERview[:OQPSk]:STATus? **FETCh:MODulation:OVERview:HPSK:STATus?**		Measurement Status		
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	–
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).			All	V3.05 or Above

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Modulation Configuration* menu that are related to the *Overview* application.

Subsystem MODulation:OVERview:CONTrol

The subsystem *MODulation:OVERview:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Configuration*.

> ***Note:*** *The application type O-QPSK is omitted from the commands to remain compatible with cdmaOne. The application type H-PSK contains the type in the command. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:MODulation:OVERview[:OQPSk]:CONTrol[?] Scope of Measurement
CONFigure:MODulation:OVERview:HPSK:CONTrol[?]
<Statistic Count>, <Repetition>, <Stop Cond>, <Step Mode>

<Statistic Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 | CONTuous | SINGleshot| DEFault,	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	

Description of command	Sig. State	FW-Vers.
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.	All	V3.05 or Above

CONFigure:MODulation:OVERview[:OQPSk]:CONTrol:STATistics[?] Statistic Count
CONFigure:MODulation:OVERview:HPSK:CONTrol:STATistics[?]
<Statistic Count>

<Statistic Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	

Description of command	Sig. State	FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.	All	V3.05 or Above

CONFigure:MODulation:OVERview[:OQPSk]:CONTrol:REPetition[?] **CONFigure:MODulation:OVERview:HPSK:CONTrol:REPetition[?]** ***<Repetition>, <Stop Cond>, <Step Mode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot|	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			
Description of command			Sig. State	FW vers.
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*			All	V3.05 or Above

Tolerance values – Subsystem MODulation:OEMP

The subsystem *MODulation:OEMP:* determines the output RF signal of the CMU and defines tolerance values for the modulation measurement in all four applications. The subsystem corresponds to the *Modulation* section in the *Control* tab and to the *Limits* tab in the popup menu *Modulation Configuration.*

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:MODulation:OEMP[:OQPSk]:LEVel[?] CDMA Levels
CONFigure:MODulation:OEMP:HPSK:LEVel[?]
<CDMA Power>, <FCH Level>, <Pilot Level>

<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm |	RF1 OUT , 0 dB ext. atten	–50.0	dBm	
–120.0 dBm to –16.0 dBm |	RF2 OUT , 0 dB ext. atten			
–100.0 dBm to +7.0 dBm |	RF3 OUT , 0 dB ext. atten			
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum,	Sets the value to the range maximum			
<FCH Level>	**Description of parameters**	**Def. value**	**Def. unit**	**Unit ring**
–20.0 dB to –7.0 dB |	Forward fundamental traffic channel level	–7.4	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum,	Sets the value to the range maximum			
<Pilot Level>	**Description of parameters**	**Def. value**	**Def. unit**	**Unit ring**
–20.0 dB to –7.0 dB |	Forward pilot level	–7.0	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum	Sets the value to the range maximum			

Description of command	Sig. State	FW vers.
This command determines the signal levels of the CMU. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set. It combines the commands `...:CONTrol:POWer:CDMA` and `...:CONTrol:LEVel`.	All	V3.05 or Above

CONFigure:MODulation:OEMP[:OQPSk]:CONTrol:POWer:CDMA[?] CDMA Levels
CONFigure:MODulation:OEMP:HPSK:CONTrol:POWer:CDMA[?]
<CDMA Power>

<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm |	RF1 OUT , 0 dB ext. atten	–50.0	dBm	
–120.0 dBm to –16.0 dBm |	RF2 OUT , 0 dB ext. atten			
–100.0 dBm to +7.0 dBm |	RF3 OUT , 0 dB ext. atten			
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum	Sets the value to the range maximum			

Description of command	Sig. State	FW vers.
This command determines the total CDMA output power (absolute value, in dBm). The CDMA Power value range depends on the RF input used and the external attenuation set.	All	V3.05 or Above

CONFigure:MODulation:OEMP[:OQPSk]:CONTrol:LEVel[?] CDMA Levels
CONFigure:MODulation:OEMP:HPSK:CONTrol:LEVel[?]
<FCH Level>, <Pilot Level>

<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward fundamental traffic channel level	–7.4	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF,				

<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward pilot level	–7.0	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF				

Description of command	Sig. State	FW vers.
This command determines the levels in the forward traffic channel and the forward pilot channel of the CMU. The individual channel powers are in units relative to the total CDMA power.	All	V3.05 or Above

CONFigure:MODulation:OEMP[:OQPSk]:IMPairments[?] Impairments
CONFigure:MODulation:OEMP:HPSK:IMPairments[?]
<AWGN Level>, <BS Freq Offset>

<AWGN Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB |	AWGN level	OFF	dB	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF				

<BS Freq Offset>	Description of parameters	Def. value	Def. unit	Unit ring
–50.0 kHz to +50.0 kHz |	BS frequency offset	OFF	kHz	
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF				

Description of command	Sig. State	FW vers.
This command determines an Additional White Gaussian Noise level and a frequency offset to impair the CMU output signal.	All	V3.05 or Above

Limits

CONFigure:MODulation:OEMP[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?]
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?]

<Limit_Peak_EVM>, <Enable>, <Limit_RMS_EVM>, <Enable>, <Limit_Peak_ME>, <Enable>, <Limit_RMS_ME>, <Enable>, <Limit_Peak_PE>, <Enable>, <Limit_RMS_PE>, <Enable>, <Carrier_Feedthrough_Limit>, <Enable>, <IQ_Imbalance_Limit>, <Enable>, <Carrier_Freq_Error_Limit>, <Enable>, <Tx_Time_Error_Limit>, <Enable>, <WFM_Quality_Limit>, <Enable>

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch limit check for parameter preceding *<Enable>* on or off	ON	–	
Parameters	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error RMS	+23.6	%	
0.0 % to +100.0 %,	(ME) Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(ME) Magnitude Error RMS	+23.6	%	
0.0 deg to +45.0 deg,	(PE) Phase Error Peak	+19.6	deg	
0.0 deg to +45.0 deg,	(PE) Phase Error RMS	+13.6	deg	
–120.0 dB to –20.0 dB,	Carrier Feedthrough	–25.0	dB	
–120.0 dB to –20.0 dB,	IQ Imbalance	–30.0	dB	
0 Hz to 1000 Hz,	Carrier Frequency Error	+300	Hz	
0.0 µs to 10.0 µs	Transmit Time Error	1.0	s	
0.0 to 1.0	Waveform Quality	0.944	–	

Description of command	Sig. State	FW vers.
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keyword `CMMax` refers to the *Current* and *Max./Min.* traces. After each parameter definition, the limit check for this parameter can be enabled or disabled. Limit definition and enabling of the limit check can be done separately.	All	V3.05 or Above

Limits

CONFigure:MODulation:OEMP[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?]
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?]

<Limit_Peak_EVM>, <Enable>, <Limit_RMS_EVM>, <Enable>, <Limit_Peak_ME>, <Enable>, <Limit_RMS_ME>, <Enable>, <Limit_Peak_PE>, <Enable>, <Limit_RMS_PE>, <Enable>, <Carrier_Feedthrough_Limit>, <Enable>, <IQ_Imbalance_Limit>, <Enable>, <Carrier_Freq_Error_Limit>, <Enable>, <Tx_Time_Error_Limit>, <Enable>, <WFM_Quality_Limit>, <Enable>

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch limit check for parameter preceding *<Enable>* on or off	ON	–	

Parameters	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error RMS	+23.6	%	
0.0 % to +100.0 %,	(ME) Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(ME) Magnitude Error RMS	+23.6	%	
0.0 deg to +45.0 deg,	(PE) Phase Error Peak	+19.6	deg	
0.0 deg to +45.0 deg,	(PE) Phase Error RMS	+13.6	deg	
–120.0 dB to –20.0 dB,	Carrier Feedthrough	–25.0	dB	
–120.0 dB to –20.0 dB,	IQ Imbalance	–30.0	dB	
0 Hz to 1000 Hz,	Carrier Frequency Error	+300	Hz	
0.0 μs to 10.0 μs	Transmit Time Error	1.0	s	
0.0 to 1.0	Waveform Quality	0.944	–	

Description of command	Sig. State	FW vers.
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keyword `AVERage` refers to the *Average* trace. After each parameter definition, the limit check for this parameter can be enabled or disabled. Limit definition and enabling of the limit check can be done separately.	All	V3.05 or Above

Limit values

CONFigure:MODulation:OEMP[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]

<Limit_Peak_EVM>, <Limit_RMS_EVM>, <Limit_Peak_ME>, <Limit_RMS_ME>, <Limit_Peak_PE>, <Limit_RMS_PE>, <Carrier_Feedthrough_Limit>, <IQ_Imbalance_Limit>, <Carrier_Freq_Error_Limit>, <Tx_Time_Error_Limit>, <WFM_Quality_Limit>

Parameter	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error RMS	+23.6	%	
0.0 % to +100.0 %,	(ME) Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(ME) Magnitude Error RMS	+23.6	%	
0.0 deg to +45.0 deg,	(PE) Phase Error Peak	+19.6	deg	
0.0 deg to +45.0 deg,	(PE) Phase Error RMS	+13.6	deg	
–120.0 dB to –20.0 dB,	Carrier Feedthrough	–25.0	dB	
–120.0 dB to –20.0 dB,	IQ Imbalance	–30.0	dB	
0 Hz to 1000 Hz,	Carrier Frequency Error	+300	Hz	
0.0 μs to 10.0 μs,	Transmit Time Error	1.0	s	
0.0 to 1.0	Waveform Quality	0.944	–	

Description of command	Sig. State	FW vers.
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keyword `CMMax` refers to the *Current* and *Max./Min.* traces.	All	V3.05 or Above

Limit values

CONFigure:MODulation:OEMP[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]

<Limit_Peak_EVM>, <Limit_RMS_EVM>, <Limit_Peak_ME>, <Limit_RMS_ME>, <Limit_Peak_PE>, <Limit_RMS_PE>, <Carrier_Feedthrough_Limit>, <IQ_Imbalance_Limit>, <Carrier_Freq_Error_Limit>, <Tx_Time_Error_Limit>, <WFM_Quality_Limit>

Parameter	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error RMS	+23.6	%	
0.0 % to +100.0 %,	(ME) Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(ME) Magnitude Error RMS	+23.6	%	
0.0 deg to +45.0 deg,	(PE) Phase Error Peak	+19.6	deg	
0.0 deg to +45.0 deg,	(PE) Phase Error RMS	+13.6	deg	
–120.0 dB to –20.0 dB,	Carrier Feedthrough	–25.0	dB	
–120.0 dB to –20.0 dB,	IQ Imbalance	–30.0	dB	
0 Hz to 1000 Hz,	Carrier Frequency Error	+300	Hz	
0.0 µs to 10.0 µs,	Transmit Time Error	1.0	s	
0.0 to 1.0	Waveform Quality	0.944	–	

Description of command	Sig. State	FW vers.
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keyword `AVERage` refers to the *Average* trace.	All	V3.05 or Above

Limit Enable

CONFigure:MODulation:OEMP[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]

<Limit_Peak_EVM>, <Limit_RMS_EVM>, <Limit_Peak_ME>, <Limit_RMS_ME>, <Limit_Peak_PE>, <Limit_RMS_PE>, <Carrier_Feedthrough_Limit>, <IQ_Imbalance_Limit>, <Carrier_Freq_Error_Limit>, <Tx_Time_Error_Limit>, <WFM_Quality_Limit>

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch limit check for corresponding parameter on or off.	ON	–	

Description of command	Sig. State	FW vers.
This command enables or disables the limit check for the different traces and for the scalar modulation parameters derived from them. The keyword `CMMax` refers to the *Current* and *Max./Min.* traces.	All	V3.05 or Above

Limit Enable

CONFigure:MODulation:OEMP[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]

<Limit_Peak_EVM>, <Limit_RMS_EVM>, <Limit_Peak_ME>, <Limit_RMS_ME>, <Limit_Peak_PE>, <Limit_RMS_PE>, <Carrier_Feedthrough_Limit>, <IQ_Imbalance_Limit>, <Carrier_Freq_Error_Limit>, <Tx_Time_Error_Limit>, <WFM_Quality_Limit>

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch limit check for corresponding parameter on or off.	ON	–	

Description of command	Sig. State	FW vers.
This command enables or disables the limit check for the different traces and for the scalar modulation parameters derived from them. The keyword `AVERage` refers to the *Average* trace.	All	V3.05 or Above

DEFault:MODulation:OEMP[:OQPSk]:LIMit[?]
DEFault:MODulation:OEMP:HPSK:LIMit[?]
<Enable>

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from their default values	ON	–	

Description of command	Sig. State	FW vers.
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem MODulation:OEMP:LIMit to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	All	V3.05 or Above

Measured Values – Subsystem MODulation:OVERview

The subsystem *MODulation:OVERview* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Overview.*

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

	Scalar Results
READ[:SCALar]:MODulation:OVERview[:OQPSk]?	Start single shot measurement and return results
FETCh[:SCALar]:MODulation:OVERview[:OQPSk]?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:OVERview[:OQPSk]?	Read out measurement results (synchronized)
READ[:SCALar]:MODulation:OVERview:HPSK?	Start single shot measurement and return results
FETCh[:SCALar]:MODulation:OVERview:HPSK?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:OVERview:HPSK?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
EVM Peak (x3),	0.0 % to 100.0 %	NAN	%	
EVM RMS (x3),	0.0 % to 100.0 %	NAN	%	
Magn Error Peak (x3),	0.0 % to 100.0 %	NAN	%	
Magn Error RMS (x3),	0.0 % to 100.0 %	NAN	%	
Phase Error Peak (x3),	0.0 deg to +45.0 deg	NAN	deg	
Phase Error RMS (x3),	0.0 deg to +45.0 deg	NAN	deg	
Overv. CarrierFeedth (x3),	–120.0 dB to -20.0 dB	NAN	dB	
Overv. I/Q Imbalance (x3),	–120.0 dB to -20.0 dB (QPSK only)	NAN	dB	
Overv. Carr Freq Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
Overv. Tx Time Error (x3),	0 µs to 10 µs	NAN	µs	
Overv. WFM Quality (x3),	0 to 1	NAN	–	
Overv. MS Power (x3)	–133.0 dBm to +19.0 dBm	NAN	dB	
Overv. Current Statistics	1 to 1000	NAN	–	
Overv. Limit Matching	0.0 % to 100.0 %	NAN	%	

Description of command	Sig. State	FW vers.
These commands are always queries. They start a modulation measurement and output all scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.	All	V3.05 or Above

CALCulate[:SCALar]:MODulation:OVERview[:OQPSk]:MATChing:LIMit?
CALCulate[:SCALar]:MODulation:OVERview:HPSK:MATChing:LIMit?

Limit Matching

Returned values	Value range	Def. value	Def. unit	Unit ring
EVM Peak (x3),		INV	–	
EVM RMS (x3),	For all measured values:	INV	–	
Magn Error Peak (x3),		INV	–	
Magn Error RMS (x3),		INV	–	
Phase Error Peak (x3),	NMAU | NMAL | INV | OK	INV	–	
Phase Error RMS (x3),		INV	–	
Overv. CarrierFeedth (x3),		INV	–	
Overv. I/Q Imbalance (x3),		INV	–	
Overv. Carr Freq Error (x3),		INV	–	
Overv. Tx Time Error (x3),		INV	–	
Overv. WFM Quality (x3),		INV	–	
Overv. MS Power (x3)		INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. The following messages may be output for all measured values:	All	V3.05 or Above

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Test Object MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* measures the error vector magnitude as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation*, application *EVM O-QPSK* (*H-PSK*), and the associated popup menu *Modulation Configuration*.

Control of Measurement – Subsystem MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* controls the modulation measurement. It corresponds to the softkey *EVM O-QPSK* (*H-PSK*) in the measurement menu *Modulation*.

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:MODulation:EVMagnitude[:OQPSk]	Start new measurement	⇒ *RUN*
ABORt:MODulation:EVMagnitude[:OQPSk]	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:EVMagnitude[:OQPSk]	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:EVMagnitude[:OQPSk]	Next measurement step (*stepping mode*)	⇒ *RUN*
INITiate:MODulation:EVMagnitude:HPSK	Start new measurement	⇒ *RUN*
ABORt:MODulation:EVMagnitude:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:EVMagnitude:HPSK	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:EVMagnitude:HPSK	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.	All	V3.05 or Above

CONFigure:MODulation:EVMagnitude[:OQPSk]:EREPorting[?] Event Reporting
CONFigure:MODulation:EVMagnitude:HPSK:EREPorting[?]
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All	V3.05 or Above

FETCh[:SCALar]:MODulation:EVMagnitude[:OQPSk]:STATus? **FETCh[:SCALar]:MODulation:EVMagnitude:HPSK:STATus?**				Measurement Status
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	–
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).			All	V3.05 or Above

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Modulation Configuration* menu that are related to the *Error Vector Magnitude* application.

Subsystem MODulation:EVMagnitude:CONTrol

The subsystem *MODulation:EVMagnitude:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Configuration.*

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol[?] **CONFigure:MODulation:EVMagnitude:HPSK:CONTrol[?]** ***<Statistics Count>, <Repetition>, <Stop Cond>, <Step Mode>***				Scope of Measurement
<Statistics Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 | CONTuous | SINGleshot| DEFault,	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	
Description of command			Sig. State	FW-Vers.
This command combines the ....CONTrol:STATistics and ...CONTrol:REPetition commands, see below.			All	V3.05 or Above

CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol:RMODe[?] **CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:RMODe[?]** ***<Result Mode>***				Result mode
<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
Description of command			Sig. State	FW-Vers.
This command specifies the type of measured values.			All	V3.05 or Above

CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol:STATistics[?] Statistics Count
CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:STATistics[?]
<Statistics Count>

<Statistics Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	

Description of command	Sig. State	FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.	All	V3.05 or Above

CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol:REPetition[?] Test Cycles
CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:REPetition[?]
<Repetition> ,<Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot|	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All	V3.05 or Above

Tolerance values – Subsystem MODulation:OEMP

The subsystem *MODulation:OEMP:* (refer to page 6.123) determines the output RF signal of the CMU and defines tolerance values for the modulation measurement in all four applications. The subsystem corresponds to the *Modulation* section in the *Control* tab and to the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays:MODulation:EVMagnitude

The subsystem *SUBarrays:MODulation* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:EVMagnitude[:OQPSk][?] **CONFigure:SUBarrays:MODulation:EVMagnitude:HPSK[?]** ***<Mode>*, *<Start>*, *<Samples>***				Definition of Subarrays
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | ARIThmetical | MINimum | MAXimum	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
0 µs to 406 µs	Start time in current range	NAN	s	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 500	Number of samples in current range	NAN	–	
Description of command			Sig. State	FW vers.
This command configures the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:MODulation:EVMagnitude` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points which are located on a fixed, equidistant grid with a step width of 1 symbol period. The subranges may overlap but must be within the total range of the *Modulation* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.			All	V3.05 or Above

Measured Values – Subsystem MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Error Vector Magnitude.*

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

	Scalar Results
READ[:SCALar]:MODulation:EVMagnitude[:OQPSk]?	Start single shot measurement and return results
FETCh[:SCALar]:MODulation:EVMagnitude[:OQPSk]?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:EVMagnitude[:OQPSk]?	Read out measurement results (synchronized)
READ[:SCALar]:MODulation:EVMagnitude:HPSK?	Start single shot measurement and return results
FETCh[:SCALar]:MODulation:EVMagnitude:HPSK?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:EVMagnitude:HPSK?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
EVM Peak (x3)	0.0 % to 100.0 %	NAN	%	
EVM RMS (x3),	0.0 % to 100.0 %	NAN	%	
EVM Carrier Feedth (x3),	–120.0 dB to -20.0 dB	NAN	dB	
EVM I/Q Imbalance (x3),	–120.0 dB to -20.0 dB (QPSK only)	NAN	dB	
EVM Carr Freq Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
EVM Tx Time Error (x3),	0 µs to 10 µs	NAN	µs	
EVM Waveform Quality (x3),	0 to 1	NAN	–	
EVM MS Power (x3),	–133.0 dBm to +–19.0 dBm	NAN	dB	
EVM Current Statistics	1 to 1000	NAN	–	
EVM Limit Matching	0.0 % to 100.0 %	NAN	%	

Description of command	Sig. State	FW vers.
These commands are always queries. They start a modulation measurement and output the scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.	All	V3.05 or Above

CALCulate[:SCALar]:MODulation:EVMagnitude[:OQPSk]:MATChing:LIMit?
CALCulate[:SCALar]:MODulation:EVMagnitude:HPSK:MATChing:LIMit?

Out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
EVM Peak (x3),	For all measured values:	INV	–	
EVM RMS (x3)		INV	–	
EVM Carrier Feedth (x3),	NMAU | NMAL | INV | OK	INV	–	
EVM I/Q Imbalance (x3),		INV	–	
EVM Carr Freq Error (x3),		INV	–	
EVM Tx Time Error (x3),		INV	–	
EVM WFM Quality (x3),		INV	–	
EVM MS Power (x3)		INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value. The limits are defined with the `CONFigure:MODulation:OEMP`... commands.	All	V3.05 or Above

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

EVM in Evaluation Period

READ:ARRay:MODulation:EVMagnitude[:OQPSk]:CURRent?
READ:ARRay:MODulation:EVMagnitude[:OQPSk]:AVERage?
READ:ARRay:MODulation:EVMagnitude[:OQPSk]:MMAX?

Start single shot measurement and return results ⇒ *RUN*

FETCh:ARRay:MODulation:EVMagnitude[:OQPSk]:CURRent?
FETCh:ARRay:MODulation:EVMagnitude[:OQPSk]:AVERage?
FETCh:ARRay:MODulation:EVMagnitude[:OQPSk]:MMAX?

Read measurement results (unsynchronized) ⇒ *RUN*

SAMPle:ARRay:MODulation:EVMagnitude[:OQPSk]:CURRent?
SAMPle:ARRay:MODulation:EVMagnitude[:OQPSk]:AVERage?
SAMPle:ARRay:MODulation:EVMagnitude[:OQPSk]:MMAX?

Read measurement results (synchronized) ⇒ *RUN*

READ:ARRay:MODulation:EVMagnitude:HPSK:CURRent?
READ:ARRay:MODulation:EVMagnitude:HPSK:AVERage?
READ:ARRay:MODulation:EVMagnitude:HPSK:MMAX?

Start single shot measurement and return results ⇒ *RUN*

FETCh:ARRay:MODulation:EVMagnitude:HPSK:CURRent?
FETCh:ARRay:MODulation:EVMagnitude:HPSK:AVERage?
FETCh:ARRay:MODulation:EVMagnitude:HPSK:MMAX?

Read measurement results (unsynchronized) ⇒ *RUN*

SAMPle:ARRay:MODulation:EVMagnitude:HPSK:CURRent?
SAMPle:ARRay:MODulation:EVMagnitude:HPSK:AVERage?
SAMPle:ARRay:MODulation:EVMagnitude:HPSK:MMAX?

Read measurement results (synchronized) ⇒ *RUN*

Returned values	Value range	Def. value	Def. unit	Unit ring
1st value for error vector magnitude,	0.0 % to + 100.0 %,	NAN	%	
xth value for error vector magnitude	0.0 % to + 100.0 %	NAN	%	

Description of command	Sig. State	FW vers.
These commands are always queries. They return the error vector magnitude vs. time at fixed, equidistant test points. The number of measured values is 500, corresponding to a time range of 0 symbols to 406 microseconds. The calculation of *current, average, and mmax* (Min./Max.) results is explained in Chapter 3 (see *display mode*).	All	V3.05 or Above

Subarray Results

READ:SUBarrays:MODulation:EVMagnitude[:OQPSk]:CURRent?
READ:SUBarrays:MODulation:EVMagnitude[:OQPSk]:AVERage?
READ:SUBarrays:MODulation:EVMagnitude[:OQPSk]:MMAX?

Start single shot measurement and return results ⇒ RUN

FETCh:SUBarrays:MODulation:EVMagnitude[:OQPSk]:CURRent?
FETCh:SUBarrays:MODulation:EVMagnitude[:OQPSk]:AVERage?
FETCh:SUBarrays:MODulation:EVMagnitude[:OQPSk]:MMAX?

Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:EVMagnitude[:OQPSk]:CURRent?
SAMPle:SUBarrays:MODulation:EVMagnitude[:OQPSk]:AVERage?
SAMPle:SUBarrays:MODulation:EVMagnitude[:OQPSk]:MMAX?

Read results (synchronized) ⇒ RUN

READ:SUBarrays:MODulation:EVMagnitude:HPSK:CURRent?
READ:SUBarrays:MODulation:EVMagnitude:HPSK:AVERage?
READ:SUBarrays:MODulation:EVMagnitude:HPSK:MMAX?

Start single shot measurement and return results ⇒ RUN

FETCh:SUBarrays:MODulation:EVMagnitude:HPSK:CURRent?
FETCh:SUBarrays:MODulation:EVMagnitude:HPSK:AVERage?
FETCh:SUBarrays:MODulation:EVMagnitude:HPSK:MMAX?

Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:EVMagnitude:HPSK:CURRent?
SAMPle:SUBarrays:MODulation:EVMagnitude:HPSK:AVERage?
SAMPle:SUBarrays:MODulation:EVMagnitude:HPSK:MMAX?

Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
1st value for error vector magnitude	0.0 % to + 100.0 %,	NAN	%	
xth value for error vector magnitude	0.0 % to + 100.0 %	NAN	%	

Description of command	Sig. State	FW vers.
These commands are always queries. They measure and return the error vector magnitude versus time in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:EVMagnitude` command. The `CONFigure:SUBarrays:MODulation:EVMagnitude` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned per subrange. The calculation of *current*, *average*, *minimum*, and *maximum* results is explained in Chapter 3 (see *display mode*).	All	V3.05 or Above

Test Object MODulation:PERRor

The subsystem *MODulation:PERRor* measures the phase error as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation*, application *Phase Error*, and the associated popup menu *Modulation Configuration*.

Control of Measurement – Subsystem MODulation:PERRor

The subsystem *MODulation:PERRor* controls the modulation measurement. It corresponds to the softkey *Phase Error* in the measurement menu *Modulation*.

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:MODulation:PERRor[:OQPSk]	Start new measurement		⇒ *RUN*
ABORt:MODulation:PERRor[:OQPSk]	Abort running measurement and switch off		⇒ *OFF*
STOP:MODulation:PERRor[:OQPSk]	Stop measurement after current stat. cycle		⇒ *STOP*
CONTinue:MODulation:PERRor[:OQPSk]	Next measurement step (*stepping mode*)		⇒ *RUN*
INITiate:MODulation:PERRor:HPSK	Start new measurement		⇒ *RUN*
ABORt:MODulation:PERRor:HPSK	Abort running measurement and switch off		⇒ *OFF*
STOP:MODulation:PERRor:HPSK	Stop measurement after current stat. cycle		⇒ *STOP*
CONTinue:MODulation:PERRor:HPSK	Next measurement step (*stepping mode*)		⇒ *RUN*
Description of command		Sig. State	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.		All	V3.05 or Above

CONFigure:MODulation:PERRor[:OQPSk]:EREPorting[?] **CONFigure:MODulation:PERRor:HPSK:EREPorting[?]** ***<Report Mode>***				Event Reporting
<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF | DEFault	Service request Single operation complete SRQ and SOPC No reporting Sets the value to the default setting	OFF	–	
Description of command			Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).			All	V3.05 or Above

FETCh:MODulation:PERRor[:OQPSk]:STATus?
FETCh:MODulation:PERRor:HPSK:STATus?

Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	–
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	–

Description of command	Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	All	V3.05 or Above

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Modulation Configuration* menu that are related to the *Phase Error* application.

Subsystem MODulation:PERRor:CONTrol

The subsystem *MODulation:PERRor:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Configuration*.

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:MODulation:PERRor[:OQPSk]:CONTrol[?] Scope of Measurement
CONFigure:MODulation:PERRor:HPSK:CONTrol[?]
<Result Mode>, <Statistics Count>, <Repetition>, <Stop Cond>, <Step Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
<Statistics Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 | CONTuous | SINGleshot| DEFault,	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	

Description of command	Sig. State	FW-Vers.
This command combines the `...CONTrol:STATistics`, `...CONTrol:REPetition` and `...CONTrol:RMODe` commands.	All	V3.05 or Above

CONFigure:MODulation:PERRor[:OQPSk]:CONTrol:STATistics[?] Statistics Count
CONFigure:MODulation:PERRor:HPSK:CONTrol:STATistics[?]
<Statistics Count>

<Statistics Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	

Description of command		FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.	All	V3.05 or Above

CONFigure:MODulation:PERRor[:OQPSk]:CONTrol:REPetition Test Cycles
CONFigure:MODulation:PERRor:HPSK:CONTrol:REPetition
<Repetition>*, *<Stop Cond>*, *<Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot|	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All	V3.05 or Above

CONFigure:MODulation:PERRor[:OQPSk]:CONTrol:RMODe[?] Result Mode
CONFigure:MODulation:PERRor:HPSK:CONTrol:RMODe[?]
<Result Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar |	Scalar values only (incl. ramp matching)	ARR	–	
ARRay	Scalar measured values and arrays			

Description of command	Sig. State	FW-Vers.
This command specifies the type of measured values.	All	V3.05 or Above

Tolerance values – Subsystem MODulation:OEMP:LIMit

The subsystem *MODulation:OEMP:LIMit* (refer to page 6.123) determines the output RF signal of the CMU and defines tolerance values for the modulation measurement in all four applications. The subsystem corresponds to the *Modulation* section in the *Control* tab and to the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays:MODulation:PERRor

The subsystem *SUBarrays:MODulation:PERRor* defines the measurement range and the type of output values.

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:SUBarrays:MODulation:PERRor[:OQPSk] **CONFigure:SUBarrays:MODulation:PERRor:HPSK** ***<Mode>*, *<Start>*, *<Samples>***				Definition of Subarrays
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | ARIThmetical | MINimum | MAXimum	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
0 µs to 406 µs	Start time in current range	NAN	s	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 500	Number of samples in current range	NAN	–	
Description of command			Sig. State	FW vers.
This command configures the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:MODulation:PERRor` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points which are located on a fixed, equidistant grid with a step width of 1 symbol period. The subranges may overlap but must be within the total range of the *Modulation* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.			All	V3.05 or Above

Measured Values – Subsystem MODulation:PERRor

The subsystem *MODulation:PERRor* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation*, application *Phase Error*.

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

	Scalar Results:
READ[:SCALar]:MODulation:PERRor[:OQPSk]?	Start single shot measurement and return results
FETCh[:SCALar]:MODulation:PERRor[:OQPSk]?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:PERRor[:OQPSk]?	Read out measurement results (synchronized)
READ[:SCALar]:MODulation:PERRor:HPSK?	Start single shot measurement and return results
FETCh[:SCALar]:MODulation:PERRor:HPSK?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:PERRor:HPSK?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
PE Peak (x3),	0.0 deg to +45.0 deg	NAN	%	
PE RMS (x3),	0.0 deg to +45.0 deg	NAN	%	
PE Carrier Feedth (x3),	–120.0 dB to -20.0 dB	NAN	dB	
PE I/Q Imbalance (x3),	–120.0 dB to -20.0 dB (QPSK only)	NAN	dB	
PE Carr Freq Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
PE Tx Time Error (x3),	0 µs to 10 µs	NAN	µs	
PE WFM Quality (x3),	0 to 1	NAN	–	
PE MS Power (x3),	–133.0 dBm to +–19.0 dBm	NAN	dBm	
PE Current Statistics	1 to 1000	NAN	–	
PE Limit Matching	0.0 % to 100.0 %	NAN	%	

Description of command	Sig. State	FW vers.
These commands are always queries. They start a modulation measurement and output the scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value.	All	V3.05 or Above

CALCulate[:SCALar]:MODulation:PERRor[:OQPSk]:MATChing:LIMit? **CALCulate[:SCALar]:MODulation:PERRor:HPSK:MATChing:LIMit?**.				Out of Tolerance
Returned values	Value range	Def. value	Def. unit	Unit ring
PE Peak (x3), PE RMS (x3) PE CarrierFeedth (x3), PE I/Q Imbalance (x3), PE Carr Freq Error (x3), PE Tx Time Error (x3), PE WFM Quality (x3), PE MS Power (x3)	For all measured values: NMAU | NMAL | INV | OK	INV INV INV INV INV INV INV INV	– – – – – – – –	
Description of command			Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. The limits are defined with the `CONFigure:MODulation:OEMP`... commands. The following messages may be output for all measured values: NMAU Underflow of tolerance value *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK all tolerances matched			All	V3.05 or Above

Phase Error in Burst

```
READ:ARRay:MODulation:PERRor[:OQPSk]:CURRent?
READ:ARRay:MODulation:PERRor[:OQPSk]:AVERage?
READ:ARRay:MODulation:PERRor[:OQPSk]:MMAX?
```

Start single shot measurement and return results ⇒ *RUN*

```
FETCh:ARRay:MODulation:PERRor[:OQPSk]:CURRent?
FETCh:ARRay:MODulation:PERRor[:OQPSk]:AVERage?
FETCh:ARRay:MODulation:PERRor[:OQPSk]:MMAX?
```

Read measurement results (unsynchronized) ⇒ *RUN*

```
SAMPle:ARRay:MODulation:PERRor[:OQPSk]:CURRent?
SAMPle:ARRay:MODulation:PERRor[:OQPSk]:AVERage?
SAMPle:ARRay:MODulation:PERRor[:OQPSk]:MMAX?
```

Read measurement results (synchronized) ⇒ *RUN*

```
READ:ARRay:MODulation:PERRor:HPSK:CURRent?
READ:ARRay:MODulation:PERRor:HPSK:AVERage?
READ:ARRay:MODulation:PERRor:HPSK:MMAX?
```

Start single shot measurement and return results ⇒ *RUN*

```
FETCh:ARRay:MODulation:PERRor:HPSK:CURRent?
FETCh:ARRay:MODulation:PERRor:HPSK:AVERage?
FETCh:ARRay:MODulation:PERRor:HPSK:MMAX?
```

Read measurement results (unsynchronized) ⇒ *RUN*

```
SAMPle:ARRay:MODulation:PERRor:HPSK:CURRent?
SAMPle:ARRay:MODulation:PERRor:HPSK:AVERage?
SAMPle:ARRay:MODulation:PERRor:HPSK:MMAX?
```

Read measurement results (synchronized) ⇒ *RUN*

Returned values	Value range	Def. value	Def. unit	Unit ring
1st value for phase error	–100.0 deg to + 100.0 deg,	NAN	deg	
xth value for phase error	–100.0 deg to + 100.0 deg	NAN	deg	

Description of command	Sig. State	FW vers.
These commands are always queries. They return the phase error vs. time at fixed, equidistant test points. The number of measured values is 500, corresponding to a time range of 0 symbols to 406 microseconds. The calculation of *current, average, and mmax* (Min./Max.) results is explained in Chapter 3 (see *display mode*).	All	V3.05 or Above

Subarray Results

READ:SUBarrays:MODulation:PERRor[:OQPSk]:CURRent?
READ:SUBarrays:MODulation:PERRor[:OQPSk]:AVERage?
READ:SUBarrays:MODulation:PERRor[:OQPSk]:MMAX?

Start single shot measurement and return results ⇒ RUN

FETCh:SUBarrays:MODulation:PERRor[:OQPSk]:CURRent?
FETCh:SUBarrays:MODulation:PERRor[:OQPSk]:AVERage?
FETCh:SUBarrays:MODulation:PERRor[:OQPSk]:MMAX?

Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:PERRor[:OQPSk]:CURRent?
SAMPle:SUBarrays:MODulation:PERRor[:OQPSk]:AVERage?
SAMPle:SUBarrays:MODulation:PERRor[:OQPSk]:MMAX?

Read results (synchronized) ⇒ RUN

READ:SUBarrays:MODulation:PERRor:HPSK:CURRent?
READ:SUBarrays:MODulation:PERRor:HPSK:AVERage?
READ:SUBarrays:MODulation:PERRor:HPSK:MMAX?

Start single shot measurement and return results ⇒ RUN

FETCh:SUBarrays:MODulation:PERRor:HPSK:CURRent?
FETCh:SUBarrays:MODulation:PERRor:HPSK:AVERage?
FETCh:SUBarrays:MODulation:PERRor:HPSK:MMAX?

Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:PERRor:HPSK:CURRent?
SAMPle:SUBarrays:MODulation:PERRor:HPSK:AVERage?
SAMPle:SUBarrays:MODulation:PERRor:HPSK:MMAX?

Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	Unit ring
1st value for phase error	100.0 deg to + 100.0 deg,	NAN	deg	
xth value for phase error	–100.0 deg to + 100.0 deg	NAN	deg	

Description of command	Sig. State	FW vers.
These commands are always queries. They measure and return the phase error versus time in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:PERRor` command. The `CONFigure:SUBarrays:MODulation:PERRor` command defines a maximum of 32 subranges. If one of the statistical modes (`ARIThmetical`, `MINimum`, `MAXimum`) is set, only one value is returned per subrange. The calculation of *current, average, minimum,* and *maximum* results is explained in Chapter 3 (see *display mode*).	All	V3.05 or Above

Test Object MODulation:MERRor

The subsystem *MODulation:MERRor* measures the magnitude error as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *Magnitude Error,* and the associated popup menu *Modulation Configuration.*

Control of Measurement – Subsystem MODulation:MERRor

The subsystem *MODulation:MERRor* controls the modulation measurement. It corresponds to the softkey *Magn. Error* in the measurement menu *Modulation*.

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:MODulation:MERRor[:OQPSk]	Start new measurement	⇒ *RUN*
ABORt:MODulation:MERRor[:OQPSk]	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:MERRor[:OQPSk]	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:MERRor[:OQPSk]	Next measurement step (*stepping mode*)	⇒ *RUN*
INITiate:MODulation:MERRor:HPSK	Start new measurement	⇒ *RUN*
ABORt:MODulation:MERRor:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:MERRor:HPSK	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:MERRor:HPSK	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.	All	V3.05 or Above

CONFigure:MODulation:MERRor[:OQPSk]:EREPorting[?] Event Reporting
CONFigure:MODulation:MERRor:HPSK:EREPorting[?]
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF | DEFault	Service request Single operation complete SRQ and SOPC No reporting Sets the value to the default setting	OFF	–	

Description of command	Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All	V3.05 or Above

FETCh:MODulation:MERRor[:OQPSk]:STATus? **FETCh:MODulation:MERRor:HPSK:STATus?**		Measurement Status		
Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	–
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).			All	V3.05 or Above

Subsystem MODulation:MERRor:CONTrol

The subsystem *MODulation:MERRor:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Limits* in the popup menu *Modulation Configuration*.

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:MODulation:MERRor[:OQPSk]:CONTrol[?] Scope of Measurement
CONFigure:MODulation:MERRor:HPSK:CONTrol[?]
<Result Mode>, <Statistics Count>, <Repetition>, <Stop Cond>, <Step Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
<Statistics Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 | CONTuous | SINGleshot| DEFault,	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	
Description of command			Sig. State	FW-Vers.
This command combines the `....CONTrol:RMODe`, `....CONTrol:STATistics`, and `...CONTrol:REPetition` commands, see below.			All	V3.05 or Above

CONFigure:MODulation:MERRor[:OQPSk]:CONTrol:RMODe[?] Result mode
CONFigure:MODulation:MERRor:HPSK:CONTrol:RMODe[?]
<Result Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
Description of command			Sig. State	FW-Vers.
This command specifies the type of measured values.			All	V3.05 or Above

CONFigure:MODulation:MERRor[:OQPSk]:CONTrol:STATistics[?] **CONFigure:MODulation:MERRor:HPSK:CONTrol:STATistics[?]** ***<Statistics Count>***				Statistics Count
<Statistics Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000	Number of bursts per statistics cycle	100	–	
Description of command			Sig. State	FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.			All	V3.05 or Above

CONFigure:MODulation:MERRor[:OQPSk]:CONTrol:REPetition[?] ***<Repetition>*, *<Stop Cond>*, *<Step Mode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot|	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			
Description of command			Sig. State	FW vers.
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:** In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*			All	V3.05 or Above

Tolerance values – Subsystem MODulation:OEMP:LIMit

The subsystem *MODulation:OEMP:LIMit* (refer to page 6.123) determines the output RF signal of the CMU and defines tolerance values for the modulation measurement in all four applications. The subsystem corresponds to the *Modulation* section in the *Control* tab and to the *Limits* tab in the popup menu *Modulation Configuration*.

Subsystem SUBarrays:MODulation:MERRor

The subsystem *SUBarrays:MODulation:MERRor* defines the measurement range and the type of output values.

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:SUBarrays:MODulation:MERRor[:OQPSk][?]
CONFigure:SUBarrays:MODulation:MERRor:HPSK[?]
<Mode>, <Start>, <Samples>

Definition of Subarrays

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | ARIThmetical | MINimum | MAXimum,	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
0 µs to 406 µs,	Start time in current range	NAN	s	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 500	Number of samples in current range	NAN	–	
Description of command			Sig. State	FW vers.
This command configures the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:MODulation:MERRor` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points which are located on a fixed, equidistant grid with a step width of 1 symbol period. The subranges may overlap but must be within the total range of the *Modulation* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.			All	V3.05 or Above

Measured Values – Subsystem MODulation:MERRor

The subsystem *MODulation:MERRor* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Magnitude Error.*

> ***Note:*** *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

	Scalar Results
READ[:SCALar]:MODulation:MERRor[:OQPSk]?	Start single shot measurement and return results
FETCh[:SCALar]:MODulation:MERRor[:OQPSk]?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:MERRor[:OQPSk]?	Read out measurement results (synchronized)
READ[:SCALar]:MODulation:MERRor:HPSK?	Start single shot measurement and return results
FETCh[:SCALar]:MODulation:MERRor:HPSK?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:MERRor:HPSK?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
ME Peak (x3),	0.0 % to 100.0 %	NAN	%	
ME RMS (x3),	0.0 % to 100.0 %	NAN	%	
ME CarrierFeedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
ME I/Q Imbalance (x3),	–120.0 dB to -20.0 dB (QPSK only)	NAN	dB	
ME Carr Freq Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
ME Transmit Time Error (x3),	0 µs to 10 µs	NAN	µs	
ME Waveform Quality (x3),	0 to 1	NAN	–	
ME MS Power (x3),	–133.0 dBm to +–19.0 dBm	NAN	dB	
ME Current Statistics	1 to 1000	NAN	–	
ME Limit Matching	0.0 % to 100.0 %	NAN	%	

Description of command	Sig. State	FW vers.
These commands are always queries. They start a modulation measurement and output the scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MaxMin* value.	All	V3.05 or Above

CALCulate[:SCALar]:MODulation:MERRor[:OQPSk]:MATChing:LIMit?
CALCulate[:SCALar]:MODulation:MERRor:HPSK:MATChing:LIMit?

Out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
ME Peak (x3),		INV	–	
ME RMS (x3),	For all measured values:	INV	–	
ME CarrierFeedthrough (x3),		INV	–	
ME I/Q Imbalance (x3),		INV	–	
ME Carr Freq Error (x3),	NMAU | NMAL | INV | OK	INV	–	
ME Transmit Time Error (x3),		INV	–	
ME Waveform Quality (x3),		INV	–	
ME MS Power (x3)		INV	–	

Description of command	Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MaxMin* value. The limits are defined with the `CONFigure:MODulation:OEMP...` commands. The following messages may be output for all measured values:	All	V3.05 or Above

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Magnitude Error in Evaluation Period

```
READ:ARRay:MODulation:MERRor[:OQPSk]:CURRent?
READ:ARRay:MODulation:MERRor[:OQPSk]:AVERage?
READ:ARRay:MODulation:MERRor[:OQPSk]:MMAX?
```

Start single shot measurement and return results ⇒ *RUN*

```
FETCh:ARRay:MODulation:MERRor[:OQPSk]:CURRent?
FETCh:ARRay:MODulation:MERRor[:OQPSk]:AVERage?
FETCh:ARRay:MODulation:MERRor[:OQPSk]:MMAX?
```

Read measurement results (unsynchronized) ⇒ *RUN*

```
SAMPle:ARRay:MODulation:MERRor[:OQPSk]:CURRent?
SAMPle:ARRay:MODulation:MERRor[:OQPSk]:AVERage?
SAMPle:ARRay:MODulation:MERRor[:OQPSk]:MMAX?
```

Read measurement results (synchronized) ⇒ *RUN*

```
READ:ARRay:MODulation:MERRor:HPSK:CURRent?
READ:ARRay:MODulation:MERRor:HPSK:AVERage?
READ:ARRay:MODulation:MERRor:HPSK:MMAX?
```

Start single shot measurement and return results ⇒ *RUN*

```
FETCh:ARRay:MODulation:MERRor:HPSK:CURRent?
FETCh:ARRay:MODulation:MERRor:HPSK:AVERage?
FETCh:ARRay:MODulation:MERRor:HPSK:MMAX?
```

Read measurement results (unsynchronized) ⇒ *RUN*

```
SAMPle:ARRay:MODulation:MERRor:HPSK:CURRent?
SAMPle:ARRay:MODulation:MERRor:HPSK:AVERage?
SAMPle:ARRay:MODulation:MERRor:HPSK:MMAX?
```

Read measurement results (synchronized) ⇒ *RUN*

Returned values	Value range	Def. value	Def. unit	Unit ring
1st value for magnitude error,	0.0 % to + 100.0 %,	NAN	%	
xth value for magnitude error	0.0 % to + 100.0 %	NAN	%	

Description of command	Sig. State	FW vers.
These commands are always queries. They return the magnitude error vs. time at fixed, equidistant test points. The number of measured values is 500, corresponding to a time range of 0 symbols to 406 microseconds. The calculation of *current, average, and mmax* (Min./Max.) results is explained in Chapter 3 (see *display mode*).	All	V3.05 or Above

Subarray Results

READ:SUBarrays:MODulation:MERRor[:OQPSk]:CURRent?
READ:SUBarrays:MODulation:MERRor[:OQPSk]:AVERage?
READ:SUBarrays:MODulation:MERRor[:OQPSk]:MMAX?

Start single shot measurement and return results ⇒ RUN

FETCh:SUBarrays:MODulation:MERRor[:OQPSk]:CURRent?
FETCh:SUBarrays:MODulation:MERRor[:OQPSk]:AVERage?
FETCh:SUBarrays:MODulation:MERRor[:OQPSk]:MMAX?

Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:MERRor[:OQPSk]:CURRent?
SAMPle:SUBarrays:MODulation:MERRor[:OQPSk]:AVERage?
SAMPle:SUBarrays:MODulation:MERRor[:OQPSk]:MMAX?

Read results (synchronized) ⇒ RUN

READ:SUBarrays:MODulation:MERRor:HPSK:CURRent?
READ:SUBarrays:MODulation:MERRor:HPSK:AVERage?
READ:SUBarrays:MODulation:MERRor:HPSK:MMAX?

Start single shot measurement and return results ⇒ RUN

FETCh:SUBarrays:MODulation:MERRor:HPSK:CURRent?
FETCh:SUBarrays:MODulation:MERRor:HPSK:AVERage?
FETCh:SUBarrays:MODulation:MERRor:HPSK:MMAX?

Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:MERRor:HPSK:CURRent?
SAMPle:SUBarrays:MODulation:MERRor:HPSK:AVERage?
SAMPle:SUBarrays:MODulation:MERRor:HPSK:MMAX?

Read results (synchronized) ⇒ RUN

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
1st value for magnitude error	0.0 % to + 100.0 %,	NAN	%	
xth value for magnitude error	0.0 % to + 100.0 %	NAN	%	

Description of command	Sig. State	FW vers.
These commands are always queries. They measure and return the magnitude error versus time in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:MERRor` command. The `CONFigure:SUBarrays:MODulation:MERRor` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned per subrange. The calculation of *current, average, minimum,* and *maximum* results is explained in Chapter 3 (see *display mode*).	All	V3.05 or Above

Test Object Receiver Quality

The subsystem *Receiver Quality* measures the receiver quality of the CDMA mobile phone. The settings are used to assess the quality of transmission between the CMU and the device under test. The subsystem corresponds to the main menu *Receiver Quality* and the associated popup menu *Receiver Quality Configuration.*

> ***Note:*** *In order to perform channel quality and receiver quality measurements and obtain meaningful results, an appropriate test setup is required (see application examples in Chapter 2 of this manual). Consequently, for these types of measurements, the Call Established (CEST) signalling state must be reached before any of the commands retrieving test results* `(READ...?,` `FETCh...?`, `SAMPle...?`, *or* `CALCulate...LIMit?)` *can be used. Test configurations, however, can be defined any time.*

Test Object RXQuality:FER (Frame Erasure Rate)

The subsystem *RXQuality:FER* contains the commands for receiver quality measurements. The subsystem corresponds to the main menu *Receiver Quality* and the corresponding sections of the associated popup menu *Receiver Quality Configuration.*

> ***Note:*** *Receiver Quality commands define both the fundamental and supplemental channels of the traffic channel. The GPIB command abbreviations represent the following channels:*
>
> - *FCH* *GPIB commands for the Fundamental traffic channel*
> - *SCH/SCCH* *GPIB commands for the Supplemental (code) channel*
> - *FSSCommon* *GPIB commands affecting the Fundamental and Supplemental (code) channels (FCH and SCH/SCCH)*

Control of Measurement – Subsystem RXQuality:FER

The subsystem *RXQuality:FER* controls the receiver quality measurements.

CONFigure:RXQuality:FER:FSSCommon:TSETup[?] ***<Test Setup>***				Test Setup
<Test Setup>	Description of parameters	Def. value	Def. unit	Unit ring
T1 | T2 | T3 | T4 | T5 | DEFault	Test Setup 1: Sensitivity Test Setup 2: Dynamic range Test Setup 3: Traffic channel demodulation Test Setup 4: User 1 Test Setup 5: User 2 Sets the value to the default setting	T3	–	–
Description of command			Sig. State	FW vers.
This command selects one out of 5 test setups, i.e. one data set parametrizing a particular receiver quality measurement. When a test setup is switched over, the running measurement is stopped and all measured values are set invalid.			CEST	V3.05 or Above

INITiate:RXQuality:FER:FCH	Start new measurement	⇒ RUN
ABORt:RXQuality:FER:FCH	Abort running measurement and switch off	⇒ OFF
STOP:RXQuality:FER:FCH	Stop measurement	⇒ STOP
CONTinue:RXQuality:FER:FCH	Next measurement step (stepping mode)	⇒ RUN

Description of command	Sig. State	FW vers.
These commands do not exist as queries. They start or stop the current measurement, setting it to the status indicated.	All	V3.05 or Above

CONFigure:RXQuality:FER:FCH:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SRSQ			
OFF |	No reporting			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All	V3.05 or Above

FETCh[:SCALar]:RXQuality:FER:FCH:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	–
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	–
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	–
NONE	Statistic count set to off			

Description of command	Sig. State	FW vers.
This command is always a query. It returns the status of the measurement.	All	V3.05 or Above

Subsystem RXQuality:FER:CONTrol

The subsystem *RXQuality:FER:CONTrol* sets the control parameters for the receiver quality measurements. The subsystem corresponds to the tab *Control* in the popup menu *Receiver Quality Configuration.*

CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:FRAMes[?] Max. Number of Frames
<Frame Count>

<Frame Count>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 100000 |	Maximum number of frames to be sent	1000	–	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command defines the maximum number of frames to be sent for the measurement. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range and the default value is the same for all test setups.	All	V3.05 or Above

CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 10000 |	Continuous measurement (until STOP or ABORT)	SING	–	
CONTinuous |	Single shot measurement (until Status = RDY)			
SINGleshot |	Multiple measurement (counting, until Status = STEP | RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	Unit ring
NONE |	Not aborted, measurement over all frames	NONE	–	–
ALEXceeded |	Measurement aborted if any limit is exceeded			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	–
NONE |	Continue measurement according to its rep. mode			
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command defines the repetition mode, stop condition, and stepping mode for the measurement. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range and the default value is the same for all test setups.	All	V3.05 or Above

General Configurations – Subsystem RXQuality:FER:FSSCommon:CONTrol

The subsystem *RXQuality:FER:FSSCommon:CONTrol* configures the generated RF signal. It corresponds to the *CDMA Levels* and the *Impairments* section in the *Control* tab of the *Receiver Quality Configuration* menu.

CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:LEVel[?] Levels
<Pilot Level>, <FCH Level>

<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward pilot level	–7.0 (All)	dB	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault,	Sets the value to the default setting			
<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward fundamental traffic channel level	–15.6 (1)	dB	
MINimum |	Sets the value to the range minimum	–15.6 (2)	dB	
MAXimum |	Sets the value to the range maximum	–14.0 (3)	dB	
DEFault,	Sets the value to the default setting	–14.0 (4)	dB	
		–14.0 (5)	dB	
Description of command			Sig. State	FW vers.
This command determines output signal levels of the CMU. The individual channel powers are in units relative to the total CDMA power. This command combines commands `...:LEVel:FPICh` and `...LEVel:FFCH`. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range is the same for all test setups but not the default values.			All	V3.05 or Above

CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:LEVel:FPICh[?] Levels
<Pilot Level>

<Pilot Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward pilot level	–7.0 (All)	dB	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			
Description of command			Sig. State	FW vers.
This command determines the forward pilot channel level. The channel power is in units relative to the total CDMA power. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range is the same for all test setups but not the default values.			All	V3.05 or Above

CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:LEVel:FFCH[?] Levels
<FCH Level>

<FCH Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB |	Forward fundamental traffic channel level	–15.6 (1)	dB	
MINimum |	Sets the value to the range minimum	–15.6 (2)		
MAXimum |	Sets the value to the range maximum	–14.0 (3)		
DEFault	Sets the value to the default setting	–14.0 (4)		
		–14.0 (5)		
Description of command			Sig. State	FW vers.
This command determines the FFCH level. The channel power is in units relative to the total CDMA power. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range is the same for all test setups but not the default values.			All	V3.05 or Above

CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:POWer:CDMA[?] Levels
<CDMA Power>

<CDMA Power>	Description of parameters	Def. value	Def. unit	Unit ring
–120.0 dBm to –33.0 dBm |	RF1 OUT , 0 dB ext. atten |	–104.0 (1)	dBm	
–120.0 dBm to –16.0 dBm |	RF2 OUT , 0 dB ext. atten |	–25.0 (2)	dBm	
–100.0 dBm to +7.0 dBm |	RF3 OUT , 0 dB ext. atten	–75.0 (3)	dBm	
MINimum |	Sets the value to the range minimum	–70.0 (4)	dBm	
MAXimum |	Sets the value to the range maximum	–70.0 (5)	dBm	
DEFault	Sets the value to the default setting			

Description of command	Sig. State	FW vers.
This command determines the total CDMA output power (absolute value, in dBm). The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range is the same for all test setups but not the default values.	All	V3.05 or Above

CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:IMPairments[?] Impairments
<AWGN Level>, <BS Frequency Offset>

<AWGN Level>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB |	AWGN level	OFF (1)	dB	
MINimum |	Sets the value to the range minimum	OFF (2)		
MAXimum |	Sets the value to the range maximum	–1.0 (3)		
DEFault |	Sets the value to the default setting	OFF (4)		
ON |	AWGN generator on	OFF (5)		
OFF,	AWGN generator off			
<BS Frequency Offset>	Description of parameters	Def. value	Def. unit	Unit ring
–50.0 kHz to +50.0 kHz |	BS frequency offset	OFF (All)	Hz	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault |	Sets the value to the default setting			
ON |	Frequency offset on			
OFF	No frequency offset			

Description of command	Sig. State	FW vers.
This command determines an Additional White Gaussian Noise level and a frequency offset to impair the CMU output signal. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range is the same for all test setups but not the default values.	All	V3.05 or Above

CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:FRATe:FFCH[?] Frame Rate
<Frame Rate>

<Frame Rate>	Description of parameters	Def. value	Def. unit	Unit ring
EIGHth |	Frames at 1/8 of the rate set	FULL	–	
QUARter	Frames at 1/4 of the rate set			
HALF	Frames at 1/2 of the rate set			
FULL	Frames at the full rate set			
DEFault				

Description of command	Sig. State	FW vers.
This command sets the frame rate for the variable rate traffic channel. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5). The range and default value is the same for all test setups.	All	V3.05 or Above

Subsystem RXQuality:FER:FCH:LIMit

The subsystem *RXQuality:FER:FCH:LIMit* defines tolerance values for the receiver quality measurements. The subsystem corresponds to the tab *Limits* in the popup menu *Receiver Quality Configuration*.

CONFigure:RXQuality:FER:FCH:LIMit:TSETup<nr>:MFER[?] ***<Max FER Limit>***				Limits
<Max FER Limit>	Description of parameters	Def. value	Def. unit	Unit ring
0.1 % to 50.0 % | MINimum | MAXimum | DEFault | ON | OFF	Maximum Frame Error Rate Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	0.5	%	
Description of command			Sig. State	FW vers.
This command defines the tolerances for the receiver quality measurement for test setup <nr> (1 to 5). The range and default value is the same for all test setups.			All	V3.05 or Above

CONFigure:RXQuality:FER:FCH:LIMit:TSETup<nr>:CLEVel[?] ***<Min Confidence Level>***				Limits
<Min Confidence Level>	Description of parameters	Def. value	Def. unit	Unit ring
85.0 % to 99.99 % | MINimum | MAXimum | DEFault | ON | OFF	Minimum Confidence Level Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	95.0	%	
Description of command			Sig. State	FW vers.
This command defines the tolerances for the receiver quality measurement for test setup <nr> (1 to 5). The ranges and default values are the same for all test setups.			All	V3.05 or Above

Measured Values – Subsystem RXQuality:FER

The subsystem *RXQuality:FER* measures and outputs the bit error rate and compares it with the tolerance values. The subsystem corresponds to the output fields in the *Receiver Quality* menu.

READ[:SCALar]:RXQuality:FER:FCH? **FETCh[:SCALar]:RXQuality:FER:FCH?** **SAMPle[:SCALar]:RXQuality:FER:FCH?**		Scalar Results: Start single shot measurement and return results Read out meas. results (unsynchronized) Read out measurement results (synchronized)		
Returned values	Value range	Def. value	Def. unit	Unit ring
Frame Error Rate (FER), Frame Errors (abs), Elapsed Frames, Confidence Level	0.0% to 100.0% 0 to 20000 0 to 20000 0.000% to 100.000%	NAN NAN NAN NAN	% – – %	
Description of command			Sig. State	FW vers.
These commands are always queries. They start a receiver quality measurement and output the measurement results (see also detailed explanation of measured values in Chapter 4).			All	V3.05 or Above

CALCulate[:SCALar]:RXQuality:FER:FCH:MATChing:LIMit?			Limit Matching	
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
Maximum FER, Confidence Level	For all measured values: NMAU | NMAL | INV | OK	INV INV	– –	
Description of command			Sig. State	FW vers.
This command is always a query. It indicates whether and in which way the permissible error limits for the measured values of the bit error rate test (see command above) have been exceeded. The following messages can be output for the measured quantities: NMAU Underflow of tolerance value not matching, underflow NMAL Tolerance value exceeded not matching, overflow INV Measurement invalid invalid OK All tolerances matched			All	V3.05 or Above

List of Non-Signalling Commands

In the following, all remote-control commands of the CDMA2000 Non-Signalling function group are listed. They are arranged alphabetically by the second keyword of the command so that related commands are listed together.

Table 6-1: Remote-control commands (Non-Signalling)

Inputs and Outputs

[SENSe:]LEVel:MODE[?] 6.1
[SENSe:]LEVel:MAXimum[?] 6.2
TRIGger[:SEQuence]:SOURce[:OQPSk][?] 6.2
TRIGger[:SEQuence]:SOURce:HPSK[?] 6.2
TRIGger[:SEQuence]:SOURce:QPSK[?] 6.2
[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] 6.10
[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude] 6.10
INPut[:STATe] 6.9
OUTPut[:STATe] 6.9
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude] 6.10
SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude] 6.10
SOURce:DM:CLOCk:STATe 6.10

Impairments

SOURce:IMPairments:FOFFset[:RF][?] 6.9
SOURce:IMPairments:LEVel:AWGN[?] 6.8

Modulation

ABORt:MODulation:MQUality:HPSK 6.14
ABORt:MODulation:MQUality:OQPSk 6.14
ABORt:MODulation:MQUality:QPSK 6.14
CALCulate[:SCALar]:MODulation:MQUality:HPSK:MATChing:LIMIt? 6.21
CALCulate[:SCALar]:MODulation:MQUality:OQPSk:MATChing:LIMIt? 6.21
CALCulate[:SCALar]:MODulation:MQUality:QPSK:MATChing:LIMIt? 6.21
CONFigure:MODulation:MQUality:HPSK:AVERage:LIMit[?] 6.19
CONFigure:MODulation:MQUality:HPSK:CMMax:LIMit[?] 6.18
CONFigure:MODulation:MQUality:HPSK:CONTrol:REPetition[?] 6.17
CONFigure:MODulation:MQUality:HPSK:CONTrol:SBANd:FOFFset[?] 6.18
CONFigure:MODulation:MQUality:HPSK:CONTrol:STATistics[?] 6.17
CONFigure:MODulation:MQUality:HPSK:CONTrol[?] 6.16
CONFigure:MODulation:MQUality:HPSK:EREPorting[?] 6.14
CONFigure:MODulation:MQUality:OQPSk:AVERage:LIMit[?] 6.19
CONFigure:MODulation:MQUality:OQPSk:CMMax:LIMit[?] 6.18
CONFigure:MODulation:MQUality:OQPSk:CONTrol:REPetition[?] 6.17
CONFigure:MODulation:MQUality:OQPSk:CONTrol:SBANd:FOFFset[?] 6.18
CONFigure:MODulation:MQUality:OQPSk:CONTrol:STATistics[?] 6.17
CONFigure:MODulation:MQUality:OQPSk:CONTrol[?] 6.16
CONFigure:MODulation:MQUality:OQPSk:EREPorting[?] 6.14
CONFigure:MODulation:MQUality:QPSK:AVERage:LIMit[?] 6.19
CONFigure:MODulation:MQUality:QPSK:CMMax:LIMit[?] 6.18
CONFigure:MODulation:MQUality:QPSK:CONTrol:REPetition[?] 6.17
CONFigure:MODulation:MQUality:QPSK:CONTrol:SBANd:FOFFset[?] 6.18
CONFigure:MODulation:MQUality:QPSK:CONTrol:STATistics[?] 6.17
CONFigure:MODulation:MQUality:QPSK:CONTrol[?] 6.16
CONFigure:MODulation:MQUality:QPSK:EREPorting[?] 6.14

CONTinue:MODulation:MQUality:HPSK ... 6.14
CONTinue:MODulation:MQUality:OQPSk ... 6.14
CONTinue:MODulation:MQUality:QPSK ... 6.14
DEFault:MODulation:MQUality:CONTrol[?] ... 6.16
DEFault:MODulation:MQUality:HPSK:AVERage:LIMit[?] ... 6.20
DEFault:MODulation:MQUality:HPSK:CMMax:LIMit[?] ... 6.19
DEFault:MODulation:MQUality:HPSK:CONTrol[?] ... 6.17
DEFault:MODulation:MQUality:LIMit[?] ... 6.20
DEFault:MODulation:MQUality:OQPSk:AVERage:LIMit[?] ... 6.20
DEFault:MODulation:MQUality:OQPSk:CMMax:LIMit[?] ... 6.19
DEFault:MODulation:MQUality:OQPSk:CONTrol[?] ... 6.17
DEFault:MODulation:MQUality:QPSK:AVERage:LIMit[?] ... 6.20
DEFault:MODulation:MQUality:QPSK:CMMax:LIMit[?] ... 6.19
DEFault:MODulation:MQUality:QPSK:CONTrol[?] ... 6.17
FETCh[:SCALar]:MODulation:MQUality:HPSK:STATus? ... 6.15
FETCh[:SCALar]:MODulation:MQUality:HPSK? ... 6.21
FETCh[:SCALar]:MODulation:MQUality:OQPSk:STATus? ... 6.15
FETCh[:SCALar]:MODulation:MQUality:OQPSk? ... 6.21
FETCh[:SCALar]:MODulation:MQUality:QPSK:STATus? ... 6.15
FETCh[:SCALar]:MODulation:MQUality:QPSK? ... 6.21
INITiate:MODulation:MQUality:HPSK ... 6.14
INITiate:MODulation:MQUality:OQPSk ... 6.14
INITiate:MODulation:MQUality:QPSK ... 6.14
READ[:SCALar]:MODulation:MQUality:HPSK? ... 6.21
READ[:SCALar]:MODulation:MQUality:OQPSk? ... 6.21
READ[:SCALar]:MODulation:MQUality:QPSK? ... 6.21
SAMPle[:SCALar]:MODulation:MQUality:HPSK? ... 6.21
SAMPle[:SCALar]:MODulation:MQUality:OQPSk? ... 6.21
SAMPle[:SCALar]:MODulation:MQUality:QPSK? ... 6.21
STOP:MODulation:MQUality:HPSK ... 6.14
STOP:MODulation:MQUality:OQPSk ... 6.14
STOP:MODulation:MQUality:QPSK ... 6.14

RF Analyzer

[SENSe:]RFANalyzer:FOFFset[?] ... 6.4
[SENSe:]RFANalyzer:FREQuency:UNIT[?] ... 6.3
[SENSe:]RFANalyzer:FREQuency[?] ... 6.3

RF Generator

ABORt:RFGenerator ... 6.4
FETCh:RFGenerator:STATus? ... 6.4
INITiate:RFGenerator ... 6.4
SOURce:RFGenerator:CHANnel:FFCH[?] ... 6.5
SOURce:RFGenerator:FRATe:FFCH[?] ... 6.6
SOURce:RFGenerator:FREQuency[:RF]:UNIT[?] ... 6.5
SOURce:RFGenerator:FREQuency[:RF][?] ... 6.5
SOURce:RFGenerator:FROFfset:FFCH[?] ... 6.6
SOURce:RFGenerator:LEVel:FFCH[?] ... 6.7
SOURce:RFGenerator:LEVel:FPCH[?] ... 6.8
SOURce:RFGenerator:LEVel:FPICh[?] ... 6.8
SOURce:RFGenerator:LEVel:FSYNc[?] ... 6.7
SOURce:RFGenerator:LEVel:OCNS:ENABle[?] ... 6.5
SOURce:RFGenerator:LEVel:OCNS:VALue? ... 6.4
SOURce:RFGenerator:MODulation:MODe[?] ... 6.6
SOURce:RFGenerator:POWer:CDMA[?] ... 6.7

SOURce:RFGenerator:POWer:OUTput? 6.7
SOURce:RFGenerator:PROPerty:PNOFfset[?] 6.6

Narrow Band Power

ABORt:NPOWer 6.11
CONFigure:NPOWer:CONTrol:REPetition[?] 6.13
CONFigure:NPOWer:CONTrol:STATistics[?] 6.12
CONFigure:NPOWer:CONTrol[?] 6.12
CONFigure:NPOWer:EPOWer[?] 6.12
CONFigure:NPOWer:EREPorting[?] 6.11
CONTinue:NPOWer 6.11
FETCh[:SCALar]:NPOWer:STATus? 6.11
FETCh[:SCALar]:NPOWer? 6.13
INITiate:NPOWer 6.11
READ[:SCALar]:NPOWer? 6.13
SAMPle[:SCALar]:NPOWer? 6.13
STOP:NPOWer 6.11

List of Signalling Commands

In the following, all remote-control commands of the CDMA2000 Signalling function group are listed. They are arranged alphabetically by the second keyword of the command so that related commands are listed together.

Table 6-2: Remote-control commands (Signalling)

Inputs and Outputs

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] 6.50
[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude] 6.50
INPut[:STATe] 6.50
OUTPut[:STATe] 6.50
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude] 6.50
SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude] 6.50
SOURce:DM:CLOCk:STATe 6.51

Network

CONFigure:NETWork:IDENtity:MCC[?] 6.40
CONFigure:NETWork:IDENtity:NID[?] 6.40
CONFigure:NETWork:PCHannel:MSCindex[?] 6.44
CONFigure:NETWork:PCHannel:RATE 6.43
CONFigure:NETWork:PCHannel:SCINdex[?] 6.43
CONFigure:NETWork:REGistration:FNID[?] 6.44
CONFigure:NETWork:REGistration:FSID[?] 6.44
CONFigure:NETWork:REGistration:HOME[?] 6.44
CONFigure:NETWork:REGistration:PARReg[?] 6.45
CONFigure:NETWork:REGistration:PDOWn[?] 6.45
CONFigure:NETWork:REGistration:PUP[?] 6.45
CONFigure:NETWork:STANdard[?] 6.22
CONFigure:NETWork:SYSTem:BSID[?] 6.42
CONFigure:NETWork:SYSTem:IMSI:ETWelve[?] 6.42
CONFigure:NETWork:SYSTem:MPRevision[?] 6.42
CONFigure:NETWork:SYSTem:PREVision[?] 6.42
CONFigure:NETWork:SYSTem:SID[?] 6.41
CONFigure:NETWork:SYSTem:UWCard[?] 6.43

Signalling

[SENSe:]SIGNalling:STATe? 6.24
PROCedure:SIGNalling:ACTion 6.23

Mobile Station

[SENSe:]MSSinfo:BCLSupport? 6.25
[SENSe:]MSSinfo:PREVision? 6.25
[SENSe:]MSSinfo:SCLSupport? 6.25
[SENSe:]MSSinfo:TERMinal? 6.26
[SENSe:]MSSinfo? 6.25
CONFigure:MSSInfo:ID[?] 6.41
CONFigure:MSSInfo:MCC[?] 6.41

Service

CONFigure:SCONfig:SCLass[n]:SERVice[?] 6.26
CONFigure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:FRAT[?] 6.28
CONFigure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:PATTern[?] 6.29
CONFigure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:PGEN[?] 6.29
CONFigure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:RC[?] 6.27
CONFigure:SCONfig:SCLass<nr>:LOOP:S02D:FCH? 6.27
CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:FRAT[?] 6.28
CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:PATTern[?] 6.30
CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:PGEN[?] 6.29
CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:RC[?] 6.28
CONFigure:SCONfig:SCLass<nr>:LOOP:S09D:FCH? 6.27
CONFigure:SCONfig:SCLass<nr>:LOOP:SOPTion[?] 6.26
CONFigure:SCONfig:SCLass<nr>:SPEech:S01D:FCH:RC[?] 6.32
CONFigure:SCONfig:SCLass<nr>:SPEech:S01D:FCH? 6.30
CONFigure:SCONfig:SCLass<nr>:SPEech:S03D:FCH:RC[?] 6.32
CONFigure:SCONfig:SCLass<nr>:SPEech:S03D:FCH? 6.31
CONFigure:SCONfig:SCLass<nr>:SPEech:S17D:FCH:RC[?] 6.33
CONFigure:SCONfig:SCLass<nr>:SPEech:S17D:FCH? 6.31
CONFigure:SCONfig:SCLass<nr>:SPEech:SOPTion[?] 6.30
CONFigure:SCONfig:SCLass<nr>:SPEech:SX8T:FCH:RC[?] 6.33
CONFigure:SCONfig:SCLass<nr>:SPEech:SX8T:FCH? 6.31
PROCedure:SCONfig:SCLass[n]:SERVice[?] 6.26
PROCedure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:PATTern[?] 6.29
PROCedure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:PGEN[?] 6.29
PROCedure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:RC[?] 6.27
PROCedure:SCONfig:SCLass<nr>:LOOP:S02D:FCH:RC[?] 6.28
PROCedure:SCONfig:SCLass<nr>:LOOP:S02D:FCH? 6.27
PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:PATTern[?] 6.30
PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:PGEN[?] 6.29
PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:RC[?] 6.28
PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH:RC[?] 6.28
PROCedure:SCONfig:SCLass<nr>:LOOP:S09D:FCH? 6.27
PROCedure:SCONfig:SCLass<nr>:LOOP:SOPTion[?] 6.26
PROCedure:SCONfig:SCLass<nr>:SPEech:S01D:FCH:RC[?] 6.32
PROCedure:SCONfig:SCLass<nr>:SPEech:S01D:FCH? 6.30
PROCedure:SCONfig:SCLass<nr>:SPEech:S03D:FCH:RC[?] 6.32
PROCedure:SCONfig:SCLass<nr>:SPEech:S03D:FCH? 6.31
PROCedure:SCONfig:SCLass<nr>:SPEech:S17D:FCH:RC[?] 6.33
PROCedure:SCONfig:SCLass<nr>:SPEech:S17D:FCH? 6.31
PROCedure:SCONfig:SCLass<nr>:SPEech:SOPTion[?] 6.30
PROCedure:SCONfig:SCLass<nr>:SPEech:SX8T:FCH:RC[?] 6.33
PROCedure:SCONfig:SCLass<nr>:SPEech:SX8T:FCH? 6.31

Base Station Signal

CONFigure:BSSignal:CHANnel:FFCH[?] 6.37
CONFigure:BSSignal:CHANnel:FPCH[?] 6.38
CONFigure:BSSignal:FROFfset:FFCH[?] 6.37
CONFigure:BSSignal:LEVel:FFCH[?] 6.37
CONFigure:BSSignal:LEVel:FPCH[?] 6.38
CONFigure:BSSignal:LEVel:FPICh[?] 6.36
CONFigure:BSSignal:LEVel:FSYNc[?] 6.35
CONFigure:BSSignal:LEVel:OCNS:ENABle? 6.36
CONFigure:BSSignal:LEVel:OCNS:VALue? 6.36

CONFigure:BSSignal:POWer:CDMA[?] 6.35
CONFigure:BSSignal:POWer:OUTput? 6.35
CONFigure:BSSignal:PROPerty:PNOFfset[?] 6.38
CONFigure:BSSignal:RFCHannel[:RF][?] 6.34
CONFigure:BSSignal:RFCHannel[:RF][?] 6.34
PROCedure:BSSignal:CHANnel:FFCH[?] 6.37
PROCedure:BSSignal:CHANnel:FPCH[?] 6.38
PROCedure:BSSignal:FROFfset:FFCH[?] 6.37
PROCedure:BSSignal:LEVel:FFCH[?] 6.37
PROCedure:BSSignal:LEVel:FPCH[?] 6.38
PROCedure:BSSignal:POWer:CDMA[?] 6.35
PROCedure:BSSignal:PROPerty:PNOFfset[?] 6.38
PROCedure:BSSignal:RFCHannel[:RF][?] 6.34
PROCedure:BSSignal:RFCHannel[:RF][?] 6.34

Impairments

CONFigure:IMPairments:FOFFset[:RF][?] 6.37
CONFigure:IMPairments:LEVel:AWGN[?] 6.36

Handoff

CONFigure:HANDoff:TARGet[?] 6.39
STATus:HANDoff:TARGet:LIST? 6.39

Narrow Band Power

ABORt:NPOWer 6.46
CONFigure:NPOWer:CONTrol:REPetition[?] 6.49
CONFigure:NPOWer:CONTrol:STATistics[?] 6.48
CONFigure:NPOWer:CONTrol[?] 6.48
CONFigure:NPOWer:EPOWer[?] 6.47
CONFigure:NPOWer:EREPorting[?] 6.46
CONTinue:NPOWer 6.46
FETCh[:SCALar]:NPOWer:STATus? 6.47
FETCh[:SCALar]:NPOWer? 6.49
INITiate:NPOWer 6.46
READ[:SCALar]:NPOWer? 6.49
SAMPle[:SCALar]:NPOWer? 6.49
STOP:NPOWer 6.46

Overview

[SENSe:]OVERview:PPOWer? 6.55
ABORt:OVERview:CQUality 6.64
ABORt:OVERview:OVERview:HPSK 6.56
ABORt:OVERview:OVERview[:OQPSk] 6.56
CALCulate[:SCALar]:OVERview:CQUality:MATChing:LIMit? 6.67
CALCulate[:SCALar]:OVERview:OVERview:HPSK:MATChing:LIMit? 6.63
CALCulate[:SCALar]:OVERview:OVERview[:OQPSk]:MATChing:LIMit? 6.63
CONFigure:OVERview:CQUality:CAMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?] 6.66
CONFigure:OVERview:CQUality:CONTrol:FRAMes[?] 6.65
CONFigure:OVERview:CQUality:CONTrol:REPetition[?] 6.65
CONFigure:OVERview:CQUality:EREPorting[?] 6.64

CONFigure:OVERview:MCQuality:CONTrol:LEVel[?] 6.53
CONFigure:OVERview:MCQuality:CONTrol:POWer:CDMA[?] 6.53
CONFigure:OVERview:MCQuality:IMPairments[?] 6.54
CONFigure:OVERview:MCQuality:LEVel[?] 6.52
CONFigure:OVERview:MCQuality:PCBits[?] 6.54
CONFigure:OVERview:OVERview:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?] 6.61
CONFigure:OVERview:OVERview:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?] 6.61
CONFigure:OVERview:OVERview:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?] 6.62
CONFigure:OVERview:OVERview:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?] 6.60
CONFigure:OVERview:OVERview:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?] 6.61
CONFigure:OVERview:OVERview:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?] 6.62
CONFigure:OVERview:OVERview:HPSK:CONTrol:FOFFset:SBSuppress[?] 6.58
CONFigure:OVERview:OVERview:HPSK:CONTrol:REPetition[?] 6.58
CONFigure:OVERview:OVERview:HPSK:CONTrol:STATistics[?] 6.58
CONFigure:OVERview:OVERview:HPSK:CONTrol[?] 6.57
CONFigure:OVERview:OVERview:HPSK:EREPorting[?] 6.57
CONFigure:OVERview:OVERview[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?] 6.61
CONFigure:OVERview:OVERview[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?] 6.61
CONFigure:OVERview:OVERview[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?] 6.62
CONFigure:OVERview:OVERview[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?] 6.60
CONFigure:OVERview:OVERview[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?] 6.61
CONFigure:OVERview:OVERview[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?] 6.62
CONFigure:OVERview:OVERview[:OQPSk]:CONTrol:FOFFset:SBSuppress[?] 6.58
CONFigure:OVERview:OVERview[:OQPSk]:CONTrol:REPetition[?] 6.58
CONFigure:OVERview:OVERview[:OQPSk]:CONTrol[?] 6.57
CONFigure:OVERview:OVERview[:OQPSk]:EREPorting[?] 6.57
CONFigure:OVERview:PPOWer:ENABle[?] 6.54
CONFigure:OVERview[:OQPSk]:OVERview:CONTrol:STATistics[?] 6.58
CONTinue:OVERview:CQUality 6.64
CONTinue:OVERview:OVERview:HPSK 6.56
CONTinue:OVERview:OVERview[:OQPSk] 6.56
DEFault:OVERview:CQUality:CONTrol[?] 6.66
DEFault:OVERview:CQUality:LIMit[?] 6.67
DEFault:OVERview:OVERview:HPSK:CONTrol[?] 6.59
DEFault:OVERview:OVERview[:OQPSk]:CONTrol[?] 6.59
FETCh[:SCALar]:OVERview:CQUality:STATus? 6.64
FETCh[:SCALar]:OVERview:CQUality? 6.67
FETCh[:SCALar]:OVERview:OVERview:HPSK:STATus? 6.56
FETCh[:SCALar]:OVERview:OVERview:HPSK? 6.63
FETCh[:SCALar]:OVERview:OVERview[:OQPSk]:STATus? 6.56
FETCh[:SCALar]:OVERview:OVERview[:OQPSk]? 6.63
INITiate:OVERview:CQUality 6.64
INITiate:OVERview:OVERview:HPSK 6.56
INITiate:OVERview:OVERview[:OQPSk] 6.56
READ[:SCALar]:OVERview:CQUality? 6.67
READ[:SCALar]:OVERview:OVERview:HPSK? 6.63
READ[:SCALar]:OVERview:OVERview[:OQPSk]? 6.63
SAMPle[:SCALar]:OVERview:CQUality? 6.67
SAMPle[:SCALar]:OVERview:OVERview:HPSK? 6.63
SAMPle[:SCALar]:OVERview:OVERview[:OQPSk]? 6.63
STOP:OVERview:CQUality 6.64
STOP:OVERview:OVERview:HPSK 6.56
STOP:OVERview:OVERview[:OQPSk] 6.56

Minimum Output Power

ABORt:POWer:MIOutput:HPSK 6.68
ABORt:POWer:MIOutput[:OQPSk] 6.68

CALCulate[:SCALar]:POWer:MIOutput:HPSK:MATChing:LIMit? 6.75
CALCulate[:SCALar]:POWer:MIOutput:MATChing:LIMit? 6.75
CONFigure:POWer:MIOutput:HPSK:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?] 6.74
CONFigure:POWer:MIOutput:HPSK:CONTrol:IMPairments[?] 6.73
CONFigure:POWer:MIOutput:HPSK:CONTrol:LEVel[?] 6.73
CONFigure:POWer:MIOutput:HPSK:CONTrol:POWer:CDMA[?] 6.72
CONFigure:POWer:MIOutput:HPSK:CONTrol:REPetition[?] 6.71
CONFigure:POWer:MIOutput:HPSK:CONTrol[?] 6.70
CONFigure:POWer:MIOutput:HPSK:EREPorting[?] 6.68
CONFigure:POWer:MIOutput:HPSK:LEVel[?] 6.72
CONFigure:POWer:MIOutput:OQPSk:CONTrol:IMPairments[?] 6.73
CONFigure:POWer:MIOutput:OQPSk:CONTrol:LEVel[?] 6.73
CONFigure:POWer:MIOutput:OQPSk:CONTrol:POWer:CDMA[?] 6.72
CONFigure:POWer:MIOutput[:OQPSk]:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?] 6.74
CONFigure:POWer:MIOutput[:OQPSk]:CONTrol:REPetition[?] 6.71
CONFigure:POWer:MIOutput[:OQPSk]:CONTrol:STATistics[?] 6.70
CONFigure:POWer:MIOutput[:OQPSk]:CONTrol[?] 6.70
CONFigure:POWer:MIOutput[:OQPSk]:EREPorting[?] 6.68
CONFigure:POWer:MIOutput[:OQPSk]:LEVel[?] 6.72
CONFigure:POWer:MIOutputHPSK::CONTrol:STATistics[?] 6.70
CONTinue:POWer:MIOutput 6.68
CONTinue:POWer:MIOutput:HPSK 6.68
DEFault:POWer:MIOutput:HPSK:CONTrol[?] 6.71
DEFault:POWer:MIOutput:HPSK:LIMit[?] 6.74
DEFault:POWer:MIOutput:LIMit[?] 6.74
DEFault:POWer:MIOutput[:OQPSk]:CONTrol[?] 6.71
FETCh[:SCALar]:POWer:MIOutput:HPSK:STATus? 6.69
FETCh[:SCALar]:POWer:MIOutput:HPSK? 6.75
FETCh[:SCALar]:POWer:MIOutput[:OQPSk]:STATus? 6.69
FETCh[:SCALar]:POWer:MIOutput[:OQPSk]? 6.75
INITiate:POWer:MIOutput:HPSK 6.68
INITiate:POWer:MIOutput[:OQPSk] 6.68
READ[:SCALar]:POWer:MIOutput:HPSK? 6.75
READ[:SCALar]:POWer:MIOutput[:OQPSk]? 6.75
SAMPle[:SCALar]:POWer:MIOutput:HPSK? 6.75
SAMPle[:SCALar]:POWer:MIOutput[:OQPSk]? 6.75
STOP:POWer:MIOutput:HPSK 6.68
STOP:POWer:MIOutput[:OQPSk] 6.68

Maximum Output Power

ABORt:POWer:MAOutput:HPSK 6.76
ABORt:POWer:MAOutput[:OQPSk] 6.76
CALCulate[:SCALar]:POWer:MAOutput:HPSK:MATChing:LIMit? 6.83
CALCulate[:SCALar]:POWer:MAOutput[:OQPSk]:MATChing:LIMit? 6.83
CONFigure:POWer:MAOutput:HPSK:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?] 6.82
CONFigure:POWer:MAOutput:HPSK:CONTrol:IMPairments[?] 6.81
CONFigure:POWer:MAOutput:HPSK:CONTrol:LEVel[?] 6.81
CONFigure:POWer:MAOutput:HPSK:CONTrol:POWer:CDMA[?] 6.80
CONFigure:POWer:MAOutput:HPSK:CONTrol:REPetition[?] 6.79
CONFigure:POWer:MAOutput:HPSK:CONTrol:STATistics[?] 6.78
CONFigure:POWer:MAOutput:HPSK:CONTrol[?] 6.78
CONFigure:POWer:MAOutput:HPSK:LEVel[?] 6.80
CONFigure:POWer:MAOutput:OQPSk:CONTrol:IMPairments[?] 6.81
CONFigure:POWer:MAOutput:OQPSk:CONTrol:LEVel[?] 6.81
CONFigure:POWer:MAOutput:OQPSk:CONTrol:POWer:CDMA[?] 6.80
CONFigure:POWer:MAOutput[:OQPSk]:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?] 6.82
CONFigure:POWer:MAOutput[:OQPSk]:CONTrol:REPetition[?] 6.79

CONFigure:POWer:MAOutput[:OQPSk]:CONTrol:STATistics[?] 6.78
CONFigure:POWer:MAOutput[:OQPSk]:CONTrol[?] 6.78
CONFigure:POWer:MAOutput[:OQPSk]:EREPorting[?] 6.76
CONFigure:POWer:MAOutput[:OQPSk]:LEVel[?] 6.80
CONTinue:POWer:MAOutput:HPSK 6.76
CONTinue:POWer:MAOutput[:OQPSk] 6.76
DEFault:POWer:MAOutput:HPSK:CONTrol[?] 6.79
DEFault:POWer:MAOutput:HPSK:LIMit[?] 6.82
DEFault:POWer:MAOutput[:OQPSk]:CONTrol[?] 6.79
DEFault:POWer:MAOutput[:OQPSk]:LIMit[?] 6.82
FETCh[:SCALar]:POWer:MAOutput:HPSK:STATus? 6.77
FETCh[:SCALar]:POWer:MAOutput:HPSK? 6.83
FETCh[:SCALar]:POWer:MAOutput[:OQPSk]:STATus? 6.77
FETCh[:SCALar]:POWer:MAOutput[:OQPSk]? 6.83
INITiate:POWer:MAOutput:HPSK 6.76
INITiate:POWer:MAOutput[:OQPSk] 6.76
READ[:SCALar]:POWer:MAOutput:HPSK? 6.83
READ[:SCALar]:POWer:MAOutput[:OQPSk]? 6.83
SAMPle[:SCALar]:POWer:MAOutput:HPSK? 6.83
SAMPle[:SCALar]:POWer:MAOutput[:OQPSk]? 6.83
STOP:POWer:MAOutput:HPSK 6.76
STOP:POWer:MAOutput[:OQPSk] 6.76

Gated Output Power

ABORt:POWer:GOUTput 6.84
CALCulate:ARRay:POWer:GOUTput:MATChing:LIMit? 6.92
CALCulate[:SCALar]:POWer:GOUTput:MATChing:RAMP? 6.91
CONFigure:POWer:GOUTput:CONTrol 6.85
CONFigure:POWer:GOUTput:CONTrol:IMPairments[?] 6.88
CONFigure:POWer:GOUTput:CONTrol:LEVel[?] 6.88
CONFigure:POWer:GOUTput:CONTrol:PCGcount[?] 6.86
CONFigure:POWer:GOUTput:CONTrol:POWer:CDMA[?] 6.87
CONFigure:POWer:GOUTput:CONTrol:REPetition[?] 6.86
CONFigure:POWer:GOUTput:CONTrol:RMODe[?] 6.85
CONFigure:POWer:GOUTput:CONTrol:STATistics[?] 6.85
CONFigure:POWer:GOUTput:EREPorting 6.84
CONFigure:POWer:GOUTput:LEVel[?] 6.87
CONFigure:SUBarrays:POWer:GOUTput[?] 6.89
CONTinue:POWer:GOUTput 6.84
DEFault:POWer:GOUTput:CONTrol[?] 6.86
DEFault:POWer:GOUTput:LIMit[?] 6.89
FETCh:ARRays:POWer:GOUTput:AVERage? 6.90
FETCh:ARRays:POWer:GOUTput:CURRent? 6.90
FETCh:ARRays:POWer:GOUTput:MAXimum? 6.90
FETCh:ARRays:POWer:GOUTput:MINimum? 6.90
FETCh:SUBarrays:POWer:GOUTput:AVERage? 6.91
FETCh:SUBarrays:POWer:GOUTput:CURRent? 6.91
FETCh:SUBarrays:POWer:GOUTput:MAXimum? 6.91
FETCh:SUBarrays:POWer:GOUTput:MINimum? 6.91
FETCh[:SCALar]:POWer:GOUTput:STATus? 6.84
FETCh[:SCALar]:POWer:GOUTput? 6.90
INITiate:POWer:GOUTput 6.84
READ:ARRays:POWer:GOUTput:AVERage? 6.90
READ:ARRays:POWer:GOUTput:CURRent? 6.90
READ:ARRays:POWer:GOUTput:MAXimum? 6.90
READ:ARRays:POWer:GOUTput:MINimum? 6.90
READ:SUBarrays:POWer:GOUTput:AVERage? 6.91

READ:SUBarrays:POWer:GOUTput:CURRent? 6.91
READ:SUBarrays:POWer:GOUTput:MAXimum? 6.91
READ:SUBarrays:POWer:GOUTput:MINimum? 6.91
READ[:SCALar]:POWer:GOUTput? 6.90
SAMPle:ARRays:POWer:GOUTput:AVERage? 6.90
SAMPle:ARRays:POWer:GOUTput:CURRent? 6.90
SAMPle:ARRays:POWer:GOUTput:MAXimum? 6.90
SAMPle:ARRays:POWer:GOUTput:MINimum? 6.90
SAMPle:SUBarrays:POWer:GOUTput:AVERage? 6.91
SAMPle:SUBarrays:POWer:GOUTput:CURRent? 6.91
SAMPle:SUBarrays:POWer:GOUTput:MAXimum? 6.91
SAMPle:SUBarrays:POWer:GOUTput:MINimum? 6.91
SAMPle[:SCALar]:POWer:GOUTput? 6.90
STOP:POWer:GOUTput 6.84

Code Domain Power (Common)

CONFigure:CDPower:CPCCommon:AVERage:LIMit:ASYMmetric[:COMBined][?] 6.95
CONFigure:CDPower:CPCCommon:CMAX:LIMit:ASYMmetric[:COMBined][?] 6.95
CONFigure:CDPower:CPCCommon:CONTrol:POWer:CDMA[?] 6.93
CONFigure:CDPower:CPCCommon:IMPairments[?] 6.94
CONFigure:CDPower:CPCCommon:LEVel[?] 6.93
CONFigure:CDPower:CPCCommon:LEVel[?] 6.94
DEFault:CDPower:CPCCommon:CONTrol[?] 6.94

Code Domain Power

ABORt:CDPower:CDPW 6.96
CALCulate:ARRay:CDPower:CDPW:ISIGnal:AVERage[:RESult]:MATChing:LIMit? 6.97
CALCulate:ARRay:CDPower:CDPW:ISIGnal:CURRent[:RESult]:MATChing:LIMit? 6.97
CALCulate:ARRay:CDPower:CDPW:ISIGnal:MAXimum[:RESult]:MATChing:LIMit? 6.98
CALCulate:ARRay:CDPower:CDPW:QSIGnal:AVERage[:RESult]:MATChing:LIMit? 6.98
CALCulate:ARRay:CDPower:CDPW:QSIGnal:CURRent[:RESult]:MATChing:LIMit? 6.98
CALCulate:ARRay:CDPower:CDPW:QSIGnal:MAXimum[:RESult]:MATChing:LIMit? 6.98
CALCulate[:SCALar]:CDPower:CDPW:MATChing:LIMIt? 6.97
CONFigure:CDPower:CDPW:AVERage:LIMit:ASYMmetric[:COMBined][?] 6.97
CONFigure:CDPower:CDPW:CMAX:LIMit:ASYMmetric[:COMBined][?] 6.96
CONFigure:CDPower:CDPW:CONTrol:REPetition[?] 6.100
CONFigure:CDPower:CDPW:CONTrol:RMODe[?] 6.100
CONFigure:CDPower:CDPW:CONTrol:RORDer[?] 6.101
CONFigure:CDPower:CDPW:CONTrol:STATistics[?] 6.100
CONFigure:CDPower:CDPW:CONTrol[?] 6.99
CONFigure:CDPower:CDPW:EREPorting[?] 6.96
CONTinue:CDPower:CDPW 6.96
DEFault:CDPower:CDPW:CONTrol[?] 6.101
FETCh:ARRay:CDPower:CDPW:ISIGnal[:VALue]:AVERage? 6.102
FETCh:ARRay:CDPower:CDPW:ISIGnal[:VALue]:CURRent? 6.101
FETCh:ARRay:CDPower:CDPW:ISIGnal[:VALue]:MAXimum? 6.102
FETCh:ARRay:CDPower:CDPW:QSIGnal[:VALue]:AVERage? 6.103
FETCh:ARRay:CDPower:CDPW:QSIGnal[:VALue]:CURRent? 6.102
FETCh:ARRay:CDPower:CDPW:QSIGnal[:VALue]:MAXimum? 6.103
FETCh[:SCALar]:CDPower:CDPW:STATus 6.99
FETCh[:SCALar]:CDPower:CDPW? 6.103
INITiate:CDPower:CDPW 6.96
READ:ARRay:CDPower:CDPW:ISIGnal[:VALue]:AVERage? 6.102
READ:ARRay:CDPower:CDPW:ISIGnal[:VALue]:CURRent? 6.101
READ:ARRay:CDPower:CDPW:ISIGnal[:VALue]:MAXimum? 6.102

READ:ARRay:CDPower:CDPW:QSIGnal[:VALue]:AVERage? 6.103
READ:ARRay:CDPower:CDPW:QSIGnal[:VALue]:CURRent? 6.102
READ:ARRay:CDPower:CDPW:QSIGnal[:VALue]:MAXimum? 6.103
READ[:SCALar]:CDPower:CDPW? 6.103
SAMPle:ARRay:CDPower:CDPW:ISIGnal[:VALue]:AVERage? 6.102
SAMPle:ARRay:CDPower:CDPW:ISIGnal[:VALue]:CURRent? 6.101
SAMPle:ARRay:CDPower:CDPW:ISIGnal[:VALue]:MAXimum? 6.102
SAMPle:ARRay:CDPower:CDPW:QSIGnal[:VALue]:AVERage? 6.103
SAMPle:ARRay:CDPower:CDPW:QSIGnal[:VALue]:CURRent? 6.102
SAMPle:ARRay:CDPower:CDPW:QSIGnal[:VALue]:MAXimum? 6.103
SAMPle[:SCALar]:CDPower:CDPW? 6.103
STOP:CDPower:CDPW 6.96

Code Domain Error Power

ABORt:CDPower:PCDep 6.104
CALCulate:ARRay:CDPower:PCDep:ISIGnal:AVERage[:RESult]:MATChing:LIMit? 6.111
CALCulate:ARRay:CDPower:PCDep:ISIGnal:CURRent[:RESult]:MATChing:LIMit? 6.111
CALCulate:ARRay:CDPower:PCDep:ISIGnal:MAXimum[:RESult]:MATChing:LIMit? 6.111
CALCulate:ARRay:CDPower:PCDep:QSIGnal:AVERage[:RESult]:MATChing:LIMit? 6.112
CALCulate:ARRay:CDPower:PCDep:QSIGnal:CURRent[:RESult]:MATChing:LIMit? 6.111
CALCulate:ARRay:CDPower:PCDep:QSIGnal:MAXimum[:RESult]:MATChing:LIMit? 6.112
CALCulate[:SCALar]:CDPower:PCDep:MATChing:LIMIt? 6.110
CONFigure:CDPower:PCDep: ing[?] 6.104
CONFigure:CDPower:PCDep:AVERage:LIMit:ASYMmetric[:COMBined][?] 6.105
CONFigure:CDPower:PCDep:CMAX:LIMit:ASYMmetric[:COMBined][?] 6.104
CONFigure:CDPower:PCDep:CONTrol:REPetition[?] 6.107
CONFigure:CDPower:PCDep:CONTrol:RMODe[?] 6.106
CONFigure:CDPower:PCDep:CONTrol:RORDer[?] 6.107
CONFigure:CDPower:PCDep:CONTrol:STATistics[?] 6.107
CONFigure:CDPower:PCDep:CONTrol[?] 6.106
CONTinue:CDPower:PCDep 6.104
DEFault:CDPower:PCDep:CONTrol[?] 6.108
FETCh:ARRay:CDPower:PCDep:ISIGnal:[VALue]:AVERage? 6.108
FETCh:ARRay:CDPower:PCDep:ISIGnal:[VALue]:CURRent? 6.108
FETCh:ARRay:CDPower:PCDep:ISIGnal:[VALue]:MAXimum? 6.109
FETCh:ARRay:CDPower:PCDep:QSIGnal:[VALue]:AVERage? 6.109
FETCh:ARRay:CDPower:PCDep:QSIGnal:[VALue]:CURRent? 6.109
FETCh:ARRay:CDPower:PCDep:QSIGnal:[VALue]:MAXimum? 6.110
FETCh[:SCALar]:CDPower:PCDep:STATus? 6.105
FETCh[:SCALar]:CDPower:PCDep? 6.110
INITiate:CDPower:PCDep 6.104
READ:ARRay:CDPower:PCDep:ISIGnal:[VALue]:AVERage? 6.108
READ:ARRay:CDPower:PCDep:ISIGnal:[VALue]:CURRent? 6.108
READ:ARRay:CDPower:PCDep:ISIGnal:[VALue]:MAXimum? 6.109
READ:ARRay:CDPower:PCDep:QSIGnal:[VALue]:AVERage? 6.109
READ:ARRay:CDPower:PCDep:QSIGnal:[VALue]:CURRent? 6.109
READ:ARRay:CDPower:PCDep:QSIGnal:[VALue]:MAXimum? 6.110
READ[:SCALar]:CDPower:PCDep? 6.110
SAMPle:ARRay:CDPower:PCDep:ISIGnal:[VALue]:AVERage? 6.108
SAMPle:ARRay:CDPower:PCDep:ISIGnal:[VALue]:CURRent? 6.108
SAMPle:ARRay:CDPower:PCDep:ISIGnal:[VALue]:MAXimum? 6.109
SAMPle:ARRay:CDPower:PCDep:QSIGnal:[VALue]:AVERage? 6.109
SAMPle:ARRay:CDPower:PCDep:QSIGnal:[VALue]:CURRent? 6.109
SAMPle:ARRay:CDPower:PCDep:QSIGnal:[VALue]:MAXimum? 6.110
SAMPle[:SCALar]:CDPower:PCDep? 6.110
STOP:CDPower:PCDep 6.104

Code Domain Channel Power

ABORt:CDPower:CHPW 6.112
CALCulate[:SCALar]:CDPower:CHPW:MATChing:LIMIt? 6.114
CONFigure:CDPower:CHPW:AVERage:LIMit:ASYMmetric[:COMBined][?] 6.113
CONFigure:CDPower:CHPW:CMAX:LIMit:ASYMmetric[:COMBined][?] 6.113
CONFigure:CDPower:CHPW:CONTrol:REPetition[?] 6.116
CONFigure:CDPower:CHPW:CONTrol:RMODe[?] 6.115
CONFigure:CDPower:CHPW:CONTrol:STATistics[?] 6.115
CONFigure:CDPower:CHPW:CONTrol[?] 6.115
CONFigure:CDPower:CHPW:EREPorting[?] 6.113
CONTinue:CDPower:CHPW 6.112
DEFault:CDPower:CHPW:CONTrol[?] 6.116
FETCh:ARRay:CDPower:CHPW:ISIGnal:[VALue]:AVERage? 6.117
FETCh:ARRay:CDPower:CHPW:ISIGnal:[VALue]:CURRent? 6.117
FETCh:ARRay:CDPower:CHPW:ISIGnal:[VALue]:MAXimum? 6.117
FETCh:ARRay:CDPower:CHPW:QSIGnal:[VALue]:AVERage? 6.118
FETCh:ARRay:CDPower:CHPW:QSIGnal:[VALue]:CURRent? 6.118
FETCh:ARRay:CDPower:CHPW:QSIGnal:[VALue]:MAXimum? 6.118
FETCh[:SCALar]:CDPower:CHPW:STATus 6.114
FETCh[:SCALar]:CDPower:CHPW? 6.119
INITiate:CDPower:CHPW 6.112
READ:ARRay:CDPower:CHPW:ISIGnal:[VALue]:AVERage? 6.117
READ:ARRay:CDPower:CHPW:ISIGnal:[VALue]:CURRent? 6.117
READ:ARRay:CDPower:CHPW:ISIGnal:[VALue]:MAXimum? 6.117
READ:ARRay:CDPower:CHPW:QSIGnal:[VALue]:AVERage? 6.118
READ:ARRay:CDPower:CHPW:QSIGnal:[VALue]:CURRent? 6.118
READ:ARRay:CDPower:CHPW:QSIGnal:[VALue]:MAXimum? 6.118
READ[:SCALar]:CDPower:CHPW? 6.119
SAMPle:ARRay:CDPower:CHPW:ISIGnal:[VALue]:AVERage? 6.117
SAMPle:ARRay:CDPower:CHPW:ISIGnal:[VALue]:CURRent? 6.117
SAMPle:ARRay:CDPower:CHPW:ISIGnal:[VALue]:MAXimum? 6.117
SAMPle:ARRay:CDPower:CHPW:QSIGnal:[VALue]:AVERage? 6.118
SAMPle:ARRay:CDPower:CHPW:QSIGnal:[VALue]:CURRent? 6.118
SAMPle:ARRay:CDPower:CHPW:QSIGnal:[VALue]:MAXimum? 6.118
SAMPle[:SCALar]:CDPower:CHPW? 6.119
STOP:CDPower:CHPW 6.112

Modulation

ABORt:MODulation:EVMagnitude:HPSK 6.132
ABORt:MODulation:EVMagnitude[:OQPSk] 6.132
ABORt:MODulation:MERRor:HPSK 6.150
ABORt:MODulation:MERRor[:OQPSk] 6.150
ABORt:MODulation:OVERview:HPSK 6.120
ABORt:MODulation:OVERview[:OQPSk] 6.120
ABORt:MODulation:PERRor:HPSK 6.141
ABORt:MODulation:PERRor[:OQPSk] 6.141
CALCulate[:SCALar]:MODulation:EVMagnitude:HPSK:MATChing:LIMit? 6.138
CALCulate[:SCALar]:MODulation:EVMagnitude[:OQPSk]:MATChing:LIMit? 6.138
CALCulate[:SCALar]:MODulation:MERRor:HPSK:MATChing:LIMit? 6.156
CALCulate[:SCALar]:MODulation:MERRor[:OQPSk]:MATChing:LIMit? 6.156
CALCulate[:SCALar]:MODulation:OVERview:HPSK:MATChing:LIMit? 6.131
CALCulate[:SCALar]:MODulation:OVERview[:OQPSk]:MATChing:LIMit? 6.131
CALCulate[:SCALar]:MODulation:PERRor:HPSK:MATChing:LIMit? 6.147
CALCulate[:SCALar]:MODulation:PERRor[:OQPSk]:MATChing:LIMit? 6.147
CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:REPetition[?] 6.135
CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:STATistics[?] 6.135

CONFigure:MODulation:EVMagnitude:HPSK:CONTrol[?] 6.134
CONFigure:MODulation:EVMagnitude:HPSK:EREPorting[?] 6.132
CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol:REPetition[?] 6.135
CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol:RMODe[?] 6.134
CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol:STATistics[?] 6.135
CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol[?] 6.134
CONFigure:MODulation:MERRor:HPSK:CONTrol:REPetition[?] 6.153
CONFigure:MODulation:MERRor:HPSK:CONTrol:RMODe[?] 6.152
CONFigure:MODulation:MERRor:HPSK:CONTrol:STATistics[?] 6.153
CONFigure:MODulation:MERRor:HPSK:CONTrol[?] 6.152
CONFigure:MODulation:MERRor:HPSK:EREPorting[?] 6.150
CONFigure:MODulation:MERRor[:OQPSk]:CONTrol:REPetition[?] 6.153
CONFigure:MODulation:MERRor[:OQPSk]:CONTrol:RMODe[?] 6.152
CONFigure:MODulation:MERRor[:OQPSk]:CONTrol:STATistics[?] 6.153
CONFigure:MODulation:MERRor[:OQPSk]:CONTrol[?] 6.152
CONFigure:MODulation:MERRor[:OQPSk]:EREPorting[?] 6.150
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?] 6.127
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?] 6.128
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?] 6.126
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?] 6.127
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?] 6.128
CONFigure:MODulation:OEMP:HPSK:CONTrol:LEVel[?] 6.125
CONFigure:MODulation:OEMP:HPSK:CONtrol:POWer:CDMA[?] 6.124
CONFigure:MODulation:OEMP:HPSK:IMPairments[?] 6.125
CONFigure:MODulation:OEMP:HPSK:LEVel[?] 6.124
CONFigure:MODulation:OEMP[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?] 6.127
CONFigure:MODulation:OEMP[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?] 6.128
CONFigure:MODulation:OEMP[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?] 6.128
CONFigure:MODulation:OEMP[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?] 6.126
CONFigure:MODulation:OEMP[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?] 6.127
CONFigure:MODulation:OEMP[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?] 6.128
CONFigure:MODulation:OEMP[:OQPSk]:CONTrol:LEVel[?] 6.125
CONFigure:MODulation:OEMP[:OQPSk]:CONtrol:POWer:CDMA[?] 6.124
CONFigure:MODulation:OEMP[:OQPSk]:IMPairments[?] 6.125
CONFigure:MODulation:OEMP[:OQPSk]:LEVel[?] 6.124
CONFigure:MODulation:OVERview:HPSK:CONTrol:REPetition[?] 6.123
CONFigure:MODulation:OVERview:HPSK:CONTrol:STATistics[?] 6.122
CONFigure:MODulation:OVERview:HPSK:CONTrol[?] 6.122
CONFigure:MODulation:OVERview:HPSK:EREPorting[?] 6.120
CONFigure:MODulation:OVERview[:OQPSk]:CONTrol:REPetition[?] 6.123
CONFigure:MODulation:OVERview[:OQPSk]:CONTrol:STATistics[?] 6.122
CONFigure:MODulation:OVERview[:OQPSk]:CONTrol[?] 6.122
CONFigure:MODulation:OVERview[:OQPSk]:EREPorting[?] 6.120
CONFigure:MODulation:PERRor:HPSK:CONTrol:REPetition 6.144
CONFigure:MODulation:PERRor:HPSK:CONTrol:RMODe[?] 6.144
CONFigure:MODulation:PERRor:HPSK:CONTrol:STATistics[?] 6.143
CONFigure:MODulation:PERRor:HPSK:CONTrol[?] 6.143
CONFigure:MODulation:PERRor:HPSK:EREPorting[?] 6.141
CONFigure:MODulation:PERRor[:OQPSk]:CONTrol:REPetition 6.144
CONFigure:MODulation:PERRor[:OQPSk]:CONTrol:RMODe[?] 6.144
CONFigure:MODulation:PERRor[:OQPSk]:CONTrol:STATistics[?] 6.143
CONFigure:MODulation:PERRor[:OQPSk]:CONTrol[?] 6.143
CONFigure:MODulation:PERRor[:OQPSk]:EREPorting[?] 6.141
CONFigure:MODulation[:OQPSk]:EVMagnitude:EREPorting[?] 6.132
CONFigure:SUBarrays:MODulation:EVMagnitude:HPSK[?] 6.136
CONFigure:SUBarrays:MODulation:EVMagnitude[:OQPSk][?] 6.136
CONFigure:SUBarrays:MODulation:MERRor:HPSK[?] 6.154
CONFigure:SUBarrays:MODulation:MERRor[:OQPSk][?] 6.154
CONFigure:SUBarrays:MODulation:PERRor:HPSK 6.145

CONFigure:SUBarrays:MODulation:PERRor[:OQPSk] 6.145
CONTinue:MODulation:EVMagnitude 6.132
CONTinue:MODulation:EVMagnitude[:OQPSk] 6.132
CONTinue:MODulation:MERRor:HPSK 6.150
CONTinue:MODulation:MERRor[:OQPSk] 6.150
CONTinue:MODulation:OVERview:HPSK 6.120
CONTinue:MODulation:OVERview[:OQPSk] 6.120
CONTinue:MODulation:PERRor:HPSK 6.141
CONTinue:MODulation:PERRor[:OQPSk] 6.141
DEFault:MODulation:OEMP:HPSK:LIMit[?] 6.129
DEFault:MODulation:OEMP[:OQPSk]:LIMit[?] 6.129
FETCh:ARRAy:MODulation:EVMagnitude:HPSK:AVERage? 6.139
FETCh:ARRAy:MODulation:EVMagnitude:HPSK:CURRent? 6.139
FETCh:ARRAy:MODulation:EVMagnitude:HPSK:MMAX? 6.139
FETCh:ARRAy:MODulation:EVMagnitude[:OQPSk]:AVERage? 6.139
FETCh:ARRAy:MODulation:EVMagnitude[:OQPSk]:CURRent? 6.139
FETCh:ARRAy:MODulation:EVMagnitude[:OQPSk]:MMAX? 6.139
FETCh:ARRAy:MODulation:MERRor:HPSK:AVERage? 6.157
FETCh:ARRAy:MODulation:MERRor:HPSK:CURRent? 6.157
FETCh:ARRAy:MODulation:MERRor:HPSK:MMAX? 6.157
FETCh:ARRAy:MODulation:MERRor[:OQPSk]:AVERage? 6.157
FETCh:ARRAy:MODulation:MERRor[:OQPSk]:CURRent? 6.157
FETCh:ARRAy:MODulation:MERRor[:OQPSk]:MMAX? 6.157
FETCh:ARRAy:MODulation:PERRor:HPSK:AVERage? 6.148
FETCh:ARRAy:MODulation:PERRor:HPSK:CURRent? 6.148
FETCh:ARRAy:MODulation:PERRor:HPSK:MMAX? 6.148
FETCh:ARRAy:MODulation:PERRor[:OQPSk]:AVERage? 6.148
FETCh:ARRAy:MODulation:PERRor[:OQPSk]:CURRent? 6.148
FETCh:ARRAy:MODulation:PERRor[:OQPSk]:MMAX? 6.148
FETCh:MODulation:MERRor:HPSK:STATus? 6.151
FETCh:MODulation:MERRor[:OQPSk]:STATus? 6.151
FETCh:MODulation:OVERview:HPSK:STATus? 6.121
FETCh:MODulation:OVERview[:OQPSk]:STATus? 6.121
FETCh:MODulation:PERRor:HPSK:STATus? 6.142
FETCh:MODulation:PERRor[:OQPSk]:STATus? 6.142
FETCh:SUBarrays:MODulation:EVMagnitude:HPSK:AVERage? 6.140
FETCh:SUBarrays:MODulation:EVMagnitude:HPSK:CURRent? 6.140
FETCh:SUBarrays:MODulation:EVMagnitude:HPSK:MMAX? 6.140
FETCh:SUBarrays:MODulation:EVMagnitude[:OQPSk]:AVERage? 6.140
FETCh:SUBarrays:MODulation:EVMagnitude[:OQPSk]:CURRent? 6.140
FETCh:SUBarrays:MODulation:EVMagnitude[:OQPSk]:MMAX? 6.140
FETCh:SUBarrays:MODulation:MERRor:HPSK:AVERage? 6.158
FETCh:SUBarrays:MODulation:MERRor:HPSK:CURRent? 6.158
FETCh:SUBarrays:MODulation:MERRor:HPSK:MMAX? 6.158
FETCh:SUBarrays:MODulation:MERRor[:OQPSk]:AVERage? 6.158
FETCh:SUBarrays:MODulation:MERRor[:OQPSk]:CURRent? 6.158
FETCh:SUBarrays:MODulation:MERRor[:OQPSk]:MMAX? 6.158
FETCh:SUBarrays:MODulation:PERRor:HPSK:AVERage? 6.149
FETCh:SUBarrays:MODulation:PERRor:HPSK:CURRent? 6.149
FETCh:SUBarrays:MODulation:PERRor:HPSK:MMAX? 6.149
FETCh:SUBarrays:MODulation:PERRor[:OQPSk]:AVERage? 6.149
FETCh:SUBarrays:MODulation:PERRor[:OQPSk]:CURRent? 6.149
FETCh:SUBarrays:MODulation:PERRor[:OQPSk]:MMAX? 6.149
FETCh[:SCALar]:MODulation:EVMagnitude:HPSK:STATus? 6.133
FETCh[:SCALar]:MODulation:EVMagnitude:HPSK? 6.137
FETCh[:SCALar]:MODulation:EVMagnitude[:OQPSk]:STATus? 6.133
FETCh[:SCALar]:MODulation:EVMagnitude[:OQPSk]? 6.137
FETCh[:SCALar]:MODulation:MERRor:HPSK? 6.155
FETCh[:SCALar]:MODulation:MERRor[:OQPSk]? 6.155

FETCh[:SCALar]:MODulation:OVERview:HPSK? 6.130
FETCh[:SCALar]:MODulation:OVERview[:OQPSk]? 6.130
FETCh[:SCALar]:MODulation:PERRor:HPSK? 6.146
FETCh[:SCALar]:MODulation:PERRor[:OQPSk]? 6.146
INITiate:MODulation:EVMagnitude:HPSK 6.132
INITiate:MODulation:EVMagnitude[:OQPSk] 6.132
INITiate:MODulation:MERRor:HPSK 6.150
INITiate:MODulation:MERRor[:OQPSk] 6.150
INITiate:MODulation:OVERview:HPSK 6.120
INITiate:MODulation:OVERview[:OQPSk] 6.120
INITiate:MODulation:PERRor:HPSK 6.141
INITiate:MODulation:PERRor[:OQPSk] 6.141
READ:ARRAy:MODulation:EVMagnitude:HPSK:AVERage? 6.139
READ:ARRAy:MODulation:EVMagnitude:HPSK:CURRent? 6.139
READ:ARRAy:MODulation:EVMagnitude:HPSK:MMAX? 6.139
READ:ARRAy:MODulation:EVMagnitude[:OQPSk]:AVERage? 6.139
READ:ARRAy:MODulation:EVMagnitude[:OQPSk]:CURRent? 6.139
READ:ARRAy:MODulation:EVMagnitude[:OQPSk]:MMAX? 6.139
READ:ARRAy:MODulation:MERRor:HPSK:AVERage? 6.157
READ:ARRAy:MODulation:MERRor:HPSK:CURRent? 6.157
READ:ARRAy:MODulation:MERRor:HPSK:MMAX? 6.157
READ:ARRAy:MODulation:MERRor[:OQPSk]:AVERage? 6.157
READ:ARRAy:MODulation:MERRor[:OQPSk]:CURRent? 6.157
READ:ARRAy:MODulation:MERRor[:OQPSk]:MMAX? 6.157
READ:ARRAy:MODulation:PERRor:HPSK:AVERage? 6.148
READ:ARRAy:MODulation:PERRor:HPSK:CURRent? 6.148
READ:ARRAy:MODulation:PERRor:HPSK:MMAX? 6.148
READ:ARRAy:MODulation:PERRor[:OQPSk]:AVERage? 6.148
READ:ARRAy:MODulation:PERRor[:OQPSk]:CURRent? 6.148
READ:ARRAy:MODulation:PERRor[:OQPSk]:MMAX? 6.148
READ:SUBarrays:MODulation:EVMagnitude:HPSK:AVERage? 6.140
READ:SUBarrays:MODulation:EVMagnitude:HPSK:CURRent? 6.140
READ:SUBarrays:MODulation:EVMagnitude:HPSK:MMAX? 6.140
READ:SUBarrays:MODulation:EVMagnitude[:OQPSk]:AVERage? 6.140
READ:SUBarrays:MODulation:EVMagnitude[:OQPSk]:CURRent? 6.140
READ:SUBarrays:MODulation:EVMagnitude[:OQPSk]:MMAX? 6.140
READ:SUBarrays:MODulation:MERRor:HPSK:AVERage? 6.158
READ:SUBarrays:MODulation:MERRor:HPSK:CURRent? 6.158
READ:SUBarrays:MODulation:MERRor:HPSK:MMAX? 6.158
READ:SUBarrays:MODulation:MERRor[:OQPSk]:AVERage? 6.158
READ:SUBarrays:MODulation:MERRor[:OQPSk]:CURRent? 6.158
READ:SUBarrays:MODulation:MERRor[:OQPSk]:MMAX? 6.158
READ:SUBarrays:MODulation:PERRor:HPSK:AVERage? 6.149
READ:SUBarrays:MODulation:PERRor:HPSK:CURRent? 6.149
READ:SUBarrays:MODulation:PERRor:HPSK:MMAX? 6.149
READ:SUBarrays:MODulation:PERRor[:OQPSk]:AVERage? 6.149
READ:SUBarrays:MODulation:PERRor[:OQPSk]:CURRent? 6.149
READ:SUBarrays:MODulation:PERRor[:OQPSk]:MMAX? 6.149
READ[:SCALar]:MODulation:EVMagnitude:HPSK? 6.137
READ[:SCALar]:MODulation:EVMagnitude[:OQPSk]? 6.137
READ[:SCALar]:MODulation:MERRor:HPSK? 6.155
READ[:SCALar]:MODulation:MERRor[:OQPSk]? 6.155
READ[:SCALar]:MODulation:OVERview:HPSK? 6.130
READ[:SCALar]:MODulation:OVERview[:OQPSk]? 6.130
READ[:SCALar]:MODulation:PERRor:HPSK? 6.146
READ[:SCALar]:MODulation:PERRor[:OQPSk]? 6.146
SAMPle:ARRAy:MODulation:EVMagnitude:HPSK:AVERage? 6.139
SAMPle:ARRAy:MODulation:EVMagnitude:HPSK:CURRent? 6.139
SAMPle:ARRAy:MODulation:EVMagnitude:HPSK:MMAX? 6.139

SAMPle:ARRAy:MODulation:EVMagnitude[:OQPSk]:AVERage? 6.139
SAMPle:ARRAy:MODulation:EVMagnitude[:OQPSk]:CURRent? 6.139
SAMPle:ARRAy:MODulation:EVMagnitude[:OQPSk]:MMAX? 6.139
SAMPle:ARRAy:MODulation:MERRor:HPSK:AVERage? 6.157
SAMPle:ARRAy:MODulation:MERRor:HPSK:CURRent? 6.157
SAMPle:ARRAy:MODulation:MERRor:HPSK:MMAX? 6.157
SAMPle:ARRAy:MODulation:MERRor[:OQPSk]:AVERage? 6.157
SAMPle:ARRAy:MODulation:MERRor[:OQPSk]:CURRent? 6.157
SAMPle:ARRAy:MODulation:MERRor[:OQPSk]:MMAX? 6.157
SAMPle:ARRAy:MODulation:PERRor:HPSK:AVERage? 6.148
SAMPle:ARRAy:MODulation:PERRor:HPSK:CURRent? 6.148
SAMPle:ARRAy:MODulation:PERRor:HPSK:MMAX? 6.148
SAMPle:ARRAy:MODulation:PERRor:MMAX? 6.148
SAMPle:ARRAy:MODulation:PERRor[:OQPSk]:AVERage? 6.148
SAMPle:ARRAy:MODulation:PERRor[:OQPSk]:CURRent? 6.148
SAMPle:SUBarrays:MODulation:EVMagnitude:HPSK:AVERage? 6.140
SAMPle:SUBarrays:MODulation:EVMagnitude:HPSK:CURRent? 6.140
SAMPle:SUBarrays:MODulation:EVMagnitude:HPSK:MMAX? 6.140
SAMPle:SUBarrays:MODulation:EVMagnitude[:OQPSk]:AVERage? 6.140
SAMPle:SUBarrays:MODulation:EVMagnitude[:OQPSk]:CURRent? 6.140
SAMPle:SUBarrays:MODulation:EVMagnitude[:OQPSk]:MMAX? 6.140
SAMPle:SUBarrays:MODulation:MERRor:HPSK:AVERage? 6.158
SAMPle:SUBarrays:MODulation:MERRor:HPSK:CURRent? 6.158
SAMPle:SUBarrays:MODulation:MERRor:HPSK:MMAX? 6.158
SAMPle:SUBarrays:MODulation:MERRor[:OQPSk]:AVERage? 6.158
SAMPle:SUBarrays:MODulation:MERRor[:OQPSk]:CURRent? 6.158
SAMPle:SUBarrays:MODulation:MERRor[:OQPSk]:MMAX? 6.158
SAMPle:SUBarrays:MODulation:PERRor:HPSK:AVERage? 6.149
SAMPle:SUBarrays:MODulation:PERRor:HPSK:CURRent? 6.149
SAMPle:SUBarrays:MODulation:PERRor:HPSK:MMAX? 6.149
SAMPle:SUBarrays:MODulation:PERRor[:OQPSk]:AVERage? 6.149
SAMPle:SUBarrays:MODulation:PERRor[:OQPSk]:CURRent? 6.149
SAMPle:SUBarrays:MODulation:PERRor[:OQPSk]:MMAX? 6.149
SAMPle[:SCALar]:MODulation:EVMagnitude:HPSK? 6.137
SAMPle[:SCALar]:MODulation:EVMagnitude[:OQPSk]? 6.137
SAMPle[:SCALar]:MODulation:MERRor:HPSK? 6.155
SAMPle[:SCALar]:MODulation:MERRor[:OQPSk]? 6.155
SAMPle[:SCALar]:MODulation:OVERview:HPSK? 6.130
SAMPle[:SCALar]:MODulation:OVERview[:OQPSk]? 6.130
SAMPle[:SCALar]:MODulation:PERRor:HPSK? 6.146
SAMPle[:SCALar]:MODulation:PERRor[:OQPSk] 6.146
STOP:MODulation:EVMagnitude:HPSK 6.132
STOP:MODulation:EVMagnitude[:OQPSk] 6.132
STOP:MODulation:MERRor 6.150
STOP:MODulation:MERRor[:OQPSk] 6.150
STOP:MODulation:OVERview:HPSK 6.120
STOP:MODulation:OVERview[:OQPSk] 6.120
STOP:MODulation:PERRor:HPSK 6.141
STOP:MODulation:PERRor[:OQPSk] 6.141

Reciever Quality

ABORt:RXQuality:FER:FCH 6.160
CALCulate[:SCALar]:RXQuality:FER:FCH:MATChing:LIMit? 6.165
CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:FRAMes[?] 6.161
CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:REPetition[?] 6.161
CONFigure:RXQuality:FER:FCH:EREPorting[?] 6.160
CONFigure:RXQuality:FER:FCH:LIMit:TSETup<nr>:CLEVel[?] 6.164

CONFigure:RXQuality:FER:FCH:LIMit:TSETup<nr>:MFER[?] 6.164
CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:FRATe:FFCH[?] 6.163
CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:IMPairments[?] 6.163
CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:LEVel:FFCH[?] 6.162
CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:LEVel:FPICh[?] 6.162
CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:LEVel[?] 6.162
CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup<nr>:POWer:CDMA[?] 6.163
CONFigure:RXQuality:FER:FSSCommon:TSETup[?] 6.159
CONTinue:RXQuality:FER:FCH 6.160
FETCh[:SCALar]:RXQuality:FER:FCH:STATus? 6.160
FETCh[:SCALar]:RXQuality:FER:FCH? 6.164
INITiate:RXQuality:FER:FCH 6.160
READ[:SCALar]:RXQuality:FER:FCH? 6.164
SAMPle[:SCALar]:RXQuality:FER:FCH? 6.164
STOP:RXQuality:FER:FCH 6.160

7 Remote Control – Program Example

The following example program illustrates primary and secondary addressing by setting up a call and performing simple measurements with the CMU. In the example, remote control via GPIB bus and the programming language *Winbatch* is used.

Winbatch uses device names such as *CMUBASE, C2KCell-S, AMPS-MS* which are previously defined and assigned to the primary address, secondary address, and some general device settings.

With these device names, a complete command line reads:

```
CMUBASE: <CMU_Command>
```

where `<CMU_Command>` may be any of the commands (setting commands or queries) specified within the function group and mode identified by the device name `CMUBASE`. Program sequences consisting of commands that are defined in several function groups and modes can be re-used with an exchanged device name.

In addition to these data transfer commands, *Winbatch* provides *WHILE, GOTO*, and *IF* statements to express conditions and define loops.

With the statement:

```
WHILE C2KCell-S: sign:stat? <> REG
```

the instrument waits until it has reached the signalling state *Registered* before it executes the following commands.

For a C program assigning secondary addresses, refer to Chapter 7 of the CMU operating manual.

Preliminary configurations for different measurements are defined, and the network parameters are set. A CDMA2000 connection with F-RC 5, R-RC 4 is established, several measurements are executed followed by an handoff to AMPS.

Before running the program, configure your *Winbatch* settings such that *CMUBASE* is the device name for the CMU *BASE* system and *C2KCell-S, AMPS-MS* denote the function groups *CDMA2000 Cellular, AMPS Signalling* function groups.

```
ECHO ON

FPRINT ------------------------------------------------------------
FPRINT INITIALISATION ROUTINE:
FPRINT ASK FOR THE IDENTIFIER OF THE CMU, RESET THE INSTRUMENT,
FPRINT DEFINE THE SECONDARY ADDRESSES FOR ALL AVAILABLE FUNCTION GROUPS
FPRINT ------------------------------------------------------------

CMUBASE: *IDN?
CMUBASE: *RST;*OPC?
CMUBASE: *CLS

CMUBASE: SYST:ERR?
```

```
; Get primary and secondary addresses
CMUBASE: SYSTEM:REMOTE:ADDR:PRIM?
CMUBASE: SYST:REM:ADDR:SEC?

; Set the secondary address of the functional groups
CMUBASE: SYST:REM:ADDR:SEC?

CMUBASE: SYST:REM:ADDR:SEC 1,"CDMA2K450MS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 2,"CDMA2K450MS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 3,"CDMA2KCellMS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 4,"CDMA2KCellMS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 5,"CDMA2KPCSMS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 6,"CDMA2KPCSMS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 7,"CDMA2KIMT2KMS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 8,"CDMA2KIMT2KMS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 9,"AMPSMS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 10,"AMPSMS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 11,"RF_NSig"

CMUBASE: SYST:REM:ADDR:SEC?

FPRINT -----------------------------------------------------------------------------
FPRINT Configure the connector
FPRINT -----------------------------------------------------------------------------
C2KCell-S: INP:STAT RF2
C2KCell-S: OUTP:STAT RF2
C2KCell-S: SENS:CORR:LOSS:INP2 1.0
C2KCell-S: SENS:CORR:LOSS:OUTP2 1.0

FPRINT -----------------------------------------------------------------------------
FPRINT Network configuration
FPRINT -----------------------------------------------------------------------------

C2KCell-S: CONFigure:NETWork:STANDard USC
C2KCell-S: CONFigure:NETWork:STANDard?

C2KCell-S: CONFigure:NETWork:IDENtity:MCC?
C2KCell-S: CONFigure:NETWork:SYSTem:SID 1
C2KCell-S: CONFigure:NETWork:SYSTem:SID?
C2KCell-S: CONFigure:NETWork:IDENtity:NID?

FPRINT -----------------------------------------------------------------------------
FPRINT SUBSYSTEM BSSignal
FPRINT -----------------------------------------------------------------------------

C2KCell-S: CONFigure:BSSignal:CHANnel 283
C2KCell-S: CONFigure:BSSignal:CHANnel?
C2KCell-S: CONFigure:BSSignal:POWer:CDMA -50
C2KCell-S: CONFigure:BSSignal:POWer:CDMA?
C2KCell-S: CONFigure:BSSignal:POWer:OUTput?

FPRINT -----------------------------------------------------------------------------
FPRINT SUBSYSTEM Service Configuration
FPRINT -----------------------------------------------------------------------------

C2KCell-S: CONFigure:SCONfig:SCLass1:SERVice Loop
C2KCell-S: CONFigure:SCONfig:SCLass1:SERVice?
```

```
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:S02D:FCH:RC 1,1
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:S02D:FCH:RC?
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:S09D:FCH:RC 5,4
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:S09D:FCH:RC?

C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:S02D:FCH?
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:S09D:FCH?

C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:SOPTion S02D
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:SOPTion?

FPRINT ---------------------------------------------------------------------
FPRINT Configure Overview measurements
FPRINT ---------------------------------------------------------------------

C2KCell-S: CONFigure:OVERview:OVERview:HPSK:CONTrol:STATistics 50
C2KCell-S: CONFigure:OVERview:OVERview:HPSK:CONTrol:STATistics?

C2KCell-S: CONFigure:OVERview:CQUality:CONTrol:FRAMes 30
C2KCell-S: CONFigure:OVERview:CQUality:CONTrol:FRAMes?

C2KCell-S: CONFigure:OVERview:PPOWer:ENABle ON
C2KCell-S: CONFigure:OVERview:PPOWer:ENABle?


FPRINT ---------------------------------------------------------------------
FPRINT Configure FER measurement
FPRINT ---------------------------------------------------------------------

C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup1:POWer:CDMA -104
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup1:POWer:CDMA?
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup1:LEVel -7, -
15.6, -13.5
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup1:LEVel?

C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup1:FRAMes 10
C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup1:FRAMes?
C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup1:REPetition
SING,NONE,NONE
C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup1:REPetition?

C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup2:POWer:CDMA -25
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup2:POWer:CDMA?
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup2:LEVel -7, -
15.6, -13.5
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup2:LEVel?

C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup2:FRAMes 10
C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup2:FRAMes?
C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup2:REPetition
SING,NONE,NONE
C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup2:REPetition?

FPRINT ---------------------------------------------------------------------
FPRINT Configure NPM measurement
FPRINT ---------------------------------------------------------------------
```

```
C2KCell-S: CONFigure:NPOWer:CONTrol:REPetition SING,NONE,NONE
C2KCell-S: CONFigure:NPOWer:CONTrol:REPetition?
C2KCell-S: CONFigure:NPOWer:EREPorting?
C2KCell-S: CONFigure:NPOWer:CONTrol:STATistics 1
C2KCell-S: CONFigure:NPOWer:CONTrol:STATistics?

FPRINT ----------------------------------------------------------------------
FPRINT Configure the CMU - Function Group AMPS
FPRINT ----------------------------------------------------------------------

AMPS-MS: CONFigure:NETWork:MS:CMAC 7
AMPS-MS: CONFigure:NETWork:MS:VMAC 7
AMPS-MS: CONFIGURE:BSSIGNAL:AVC:CHANNEL 312
AMPS-MS: CONFigure:NETWork:OCHandoff:MS:VMAC 7

FPRINT ----------------------------------------------------------------------
FPRINT Switch on the RF Signal and wait for registration
FPRINT ----------------------------------------------------------------------

C2KCell-S: PROC:SIGN:ACT SON
C2KCell-S: SIGNalling:STATe?

REPORT OFF
WHILE C2KCell-S: sign:stat? <> REG
REPORT ON

C2KCell-S: SIGNalling:STATe?

FPRINT ----------------------------------------------------------------------
FPRINT Establish SO9 Call: F-RC = 5 and R-RC = 4
FPRINT ----------------------------------------------------------------------

C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:SOPTion S09D
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:SOPTion?

C2KCell-S: PROCedure:SIGNalling:ACTion CTM

REPORT OFF
WHILE C2KCell-S: sign:stat? <> CEST
REPORT ON

C2KCell-S: SIGNalling:STATe?

FPRINT ----------------------------------------------------------------------
FPRINT Overview Pilot Power, Modulation and Channel Quality in parallel
FPRINT ----------------------------------------------------------------------

C2KCell-S: INIT:OVERview:CQUality
C2KCell-S: READ:OVERview:OVERview:HPSK?
C2KCell-S: OVERview:PPOWer?

WHILE C2KCell-S: FETC:OVERview:CQUality:STAT? !{} RDY

; Collect CQuality results
C2KCell-S: FETC:OVERview:CQUality?
C2KCell-S: ABORT:OVERview:CQUality
```

```
FPRINT ----------------------------------------------------------------------
FPRINT FER measurement
FPRINT ----------------------------------------------------------------------

C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:TSETup T1
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:TSETup?
C2KCell-S: READ:SCALar:RXQuality:FER:FCH?

C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:TSETup T2
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:TSETup?
C2KCell-S: READ:SCALar:RXQuality:FER:FCH?

FPRINT ----------------------------------------------------------------------
FPRINT NPM measurement
FPRINT ----------------------------------------------------------------------

[NPOWLOOP]
C2KCell-S: READ:NPOWer?
REPEAT 15 NPOWLOOP

FPRINT ----------------------------------------------------------------------
FPRINT CDP measurement
FPRINT ----------------------------------------------------------------------

C2KCell-S: READ:SCALar:CDPower:CDPW?
C2KCell-S: READ:SCALar:CDPower:PCDep?
C2KCell-S: READ:SCALar:CDPower:CHPW?

FPRINT ----------------------------------------------------------------------
FPRINT Start the AMPS Handoff
FPRINT ----------------------------------------------------------------------

C2KCell-S: STATus:HANDoff:TARGet:LIST?
C2KCell-S: CONFigure:HANDoff:TARGet 'AMPSMS'
C2KCell-S: CONFigure:HANDoff:TARGet?

C2KCell-S: PROCedure:SIGNalling:ACTion HAND

FPRINT ----------------------------------------------------------------------
FPRINT Query the CMU State
FPRINT ----------------------------------------------------------------------

REPORT OFF
WHILE AMPS-MS: sign:stat? <> CEST
REPORT ON

FPRINT ----------------------------------------------------------------------
FPRINT AMPS Handoff was successful
FPRINT Query the power class of the mobile
FPRINT ----------------------------------------------------------------------
AMPS-MS: MSSinfo:PCLass?
```

```
FPRINT -----------------------------------------------------------------------
FPRINT Start TX Tests Modulation measurement
FPRINT Result: CarrierFreqError, TotalPeakDeviation, SATFreqError,
SATPeakDeviation, STFreqError, STPeakDeviation,
FPRINT        AudioPeakDeviation, AudioRMSDeviation, ModDistNoise,
CarrierPower, ResidualAM
FPRINT -----------------------------------------------------------------------

AMPS-MS: READ:TXT:MOD?


FPRINT -----------------------------------------------------------------------
FPRINT Call Release
FPRINT -----------------------------------------------------------------------

AMPS-MS: PROCedure:SIGNalling:ACTion CREL
```

8 Maintenance

The CMU does not require any special maintenance. Remove any contamination on the instrument by means of a soft cloth. Make sure that the air vents are not obstructed.

Refer to the CMU Operating manual detailed maintenance, storage, and packing procedures. The CMU Operating manaul also contains a list of support and service centers.

Refer to the CMU Service manual for information on troubleshooting, repair, and calibration.

9 Error Codes

Table 9-1 lists the error codes and associated messages that may occur when you are using the remote control commands.

Table 9-1: Error Codes

Error Code	Message
0	No error
-100	Command error
-101	Invalid character
-102	Syntax error
-103	Invalid separator
-104	Data type error
-105	GET not allowed
-108	Parameter not allowed
-109	Missing parameter
-111	Header separator error
-112	Program mnemonic too long
-113	Undefined header
-113	Undefined header
-114	Header suffix out of range
-120	Numeric data error
-121	Invalid character in number
-123	Exponent too large
-124	Too many digits
-128	Numeric data not allowed
-131	Invalid suffix
-134	Suffix too long
-138	Suffix not allowed
-141	Invalid character data
-144	Character data too long
-148	Character data not allowed
-151	Invalid string data
-158	String data not allowed
-161	Invalid block data
-168	Block data not allowed
-171	Invalid expression
-178	Expression data not allowed
-180	Macro error
-200	Execution error

-211	Trigger ignored
-221	Setting conflict
-222	Data out of range
-223	Too much data
-224	Illegal parameter value
-230	Data corrupt or stale
-240	Hardware error
-241	Hardware missing
-250	Mass storage error
-251	Missing mass storage
-252	Missing media
-253	Corrupt media
-254	Media full
-255	Directory full
-256	File name not found
-257	File name error
-258	Media protected
-300	Device–specific error
-310	System error
-311	Memory error
-313	Calibration memory lost
-314	Save/recall memory lost
-315	Configuration memory lost
-330	Self test failed
-350	Queue overflow
-360	Communication error
-361	Parity error in program message
-362	Framing error in program message
-363	Input buffer overrun
-400	Query error
-410	Query INTERRUPTED
-420	Query UNTERMINATED
-430	Query DEADLOCKED
-440	Query UNTERMINATED after indefinite response

Index

A

Alerting *4.24*
Analyzer
  Frequency offset *6.4*
  Non-Signalling *4.10, 4.20*
Analyzer/Generator *4.4*
Any limit exceeded 4.96
Application 3.6
  Code domain power *4.69*
  Modulation *4.54, 4.56, 4.90*
  Modulation (NS) *4.5*
  Power *4.38*
Attenuation *4.16*
Audio
  hotkey *2.8*
Auto close *4.117*
Auto open *4.117*
Average power *3.7*
AWGN *6.8, 6.36*
  Base station signal *4.108*
  Channel power *4.80*
  Code domain power *4.72, 4.76, 4.84*
  EVM *4.57*
  Modulation *4.66*
  Overview *4.34, 4.36*
  Power, gated output *4.46*
  Power, max output *4.44*
  Power, min output *4.42*
  Receiver quality *4.91, 4.95*
AWGN (NS) *4.14*
AWGN level (NS) *4.14*

B

Band classes *6.22*
Base station ID *4.110, 6.42*
Base station properties *4.109*
Base station signal *4.107*
  AWGN *4.108*
  Carrier frequency offset *4.108*
  CDMA power *4.107*
  Fundamental channel *4.108*
  Fundamental channel frame offset *4.109*
  Fundamental channel level *4.109*
  Fundamental channel QOF *4.109*
  Impairments *4.108*
  OCNS *4.108*
  Output power *4.108*
  Paging level *4.109*
  Pilot level *4.108*
  PN offset *4.109*
  RF channel *4.107*
  Sync level *4.108*
BS levels
  CDMA power *6.35*
  Output power *6.35*
  Pilot level *6.36*
  Sync level *6.35*
BS signal *2.14*
  Frame offset *6.37*
  Menu *4.107*
  Paging channel *6.38*
  PN offset *6.38*
  RF channel *6.34*
  RF unit *6.34*
  Traffic channel *6.37*
BS Signal
  Remote control *6.34*
BS signals
  Paging level *6.38*
BSID *6.42*
Burst power (trace)
  Power *6.110*

C

Calculations
  Average, Min/Max *3.7*
Call established *4.24*
Call established state *4.98*
Call from MS *4.24*
Call setup *2.11*
Call to MS *4.24*
Carrier feedthrough (NS) *4.8*
Carrier frequency error (NS) *4.8*
Carrier frequency offset *4.108*
Carrier frequency offset (NS) *4.14*
CDMA levels
  Overview *4.36*
CDMA power
  Base station signal *4.107*
  BS levels *6.35*
CDMA power (NS) *4.13, 6.7*
Channel power *4.79*
  AWGN *4.80*
  Remote control *6.112*
  Statistic count *6.115*
Channel quality
  Limits *6.66*
  Maximum frames *6.65*
  Repetition *6.65*
  Status *6.64*
  Stepping mode *6.65*
  Stop condition *6.65*
Clock *6.51*
Clock frequency *6.10*
Clock state *6.10*
Closed loop power control *4.7, 4.36*
Code *6.99*, **6.115**
Code domain
  Levels *4.71*
Code domain error power
  Remote control *6.104*
Code domain power *4.71*
  AWGN *4.72, 4.76, 4.84*
  Control *4.83*
  Measurements *4.69*
  Remote control *6.93*
Code Domain Power
  remote control *6.96*
Code domain power configuration *4.83*
Code domain power levels *6.93, 6.94*
Code domain power measurement (control)
  Signalling *4.83*
Command
  Order *5.7*
  Structure *5.1*
  Tables (description) *5.7*
Confidence level
  Receiver quality *6.164*
Confidence limit exceeded *4.96*

- Configuration
  - Code domain power 4.83
- Configurations 3.4
- Connected 4.24
- Connected state 4.98
- Connection control
  - Auto close 4.117
  - Auto open 4.117
  - Non Signalling 4.9
  - Remote control (Sig) 6.23
  - Signalling 4.24
- Connection Control
  - Remote control (NS) 6.3
- Connection control (signal off) 4.25
- Connectors (RF) 2.3
- Continuous 5.4
  - Modulation 4.55, 4.67, 4.85
  - Modulation (NS) 4.5
  - Power 4.48
  - Receiver quality 4.90, 4.96
- Control
  - Channel power 6.116
  - Code domain power 4.83
  - NPower 6.48
  - Overview 4.35
  - Power configuration 4.48
- Counting 5.4
- Current values 6.23
- Cyclic redundancy check 4.89

D

- Default
  - Code domain power configuration 4.83, 4.85, 4.87
  - Limit lines 4.51, 4.88
  - Modulation configuration 4.37, 4.65, 4.67, 4.68, 4.96
  - Overview configuration 4.35
  - Power configuration 4.48, 4.52
  - Receiver quality configuration 4.94
- Default values 6.23
- Delta marker 4.118
- Destination
  - Handoff 6.39
- Destination defaults 4.101
- Destination parameter 4.101
- Display mode 3.6
  - Average 3.7
  - Current 3.6
  - Maximum 3.7
  - Minimum 3.7
  - Modulation 4.55, 4.86
  - Modulation (NS) 4.6
  - Power 4.49
- D-Line 4.119
  - Signalling 4.39, 4.46, 4.70

E

- Enable software 1.7
- Error codes 9.1
- Event reporting
  - Power, Min output 6.68
- EVM
  - AWGN 4.57
- Expected power
  - NPower 6.12, 6.47
- Ext. att. input 4.17, 6.10, 6.50
- Ext. att. output 4.16, 6.10, 6.50
- External attenuation 4.16
  - remote control (NS) 6.9
- External triggering 4.20, 4.116

F

- FCH 4.108
- FCH configuration
  - Loopback 4.103
- FCH Configuration
  - Speech 4.105
- FCH level 6.7
- FER
  - Remote control 6.159
- FFCH level (NS) 4.11
- Frame error rate
  - Maximum 6.66
- Frame limit exceeded 4.96
- Frame offset 6.6
  - BS signal 6.37
- Frame offset (NS) 4.15
- Frame rate 6.6, 6.28
  - Loopback 4.103
  - Receiver quality 6.163
- Frame rate (NS) 4.15
- Frames, maximum
  - Overview, channel quality 6.65
- Freq. offset 6.37
- Frequency error 3.7
- Frequency offset 6.9, 6.58
  - Analyzer 6.4
- Frequency offset (NS) 4.14
- Frequency unit 6.3, 6.5
- Function group 5.1
- Functions
  - Signalling 4.22
- Fundamental channel 4.108
- Fundamental channel (NS) 4.14

G

- Gain 4.16
- Gated output 4.45
  - AWGN 4.46
- Gated output levels 4.45, 4.46
- Gated Output Levels 6.87, 6.88
- Gateway 4.116
- Generator
  - Non-Signalling 4.11
  - Remote control (NS) 6.4, 6.8
- Generator frequency
  - (NS) 4.11
  - Signalling 4.107
- Generator frequency (NS) 4.14
- Generator level (NS) 4.12
- Getting started 2.1
- GPIB error codes 9.1
- Graph
  - Error 4.59
  - Gated output 4.47

H

- Handoff
  - Destination 6.39
  - remote control 6.39
  - Target list 6.39
- Handoff (softkey) 4.101
- Handoffs 4.100
- Hotkeys 3.4

I

- I signal
  - CDPower 6.101, 6.102

- I Signal Tolerance 6.111
- Impairments 4.34, 4.36, 6.125
  - Analyzer (NS) 4.11
  - AWGN 6.36
  - Base station signal 4.108
  - Freq. offset 6.37
  - Gated output 4.46
  - Max output 4.44
  - Min output 4.42
  - Overview 4.34, 4.36
  - Overview, MCQuality 6.54
  - Receiver quality 6.163
  - RF generator (NS) 4.14
- Impairments Gated Output 6.88
- Impairments MA Output 6.81
- Impairments MI Output 6.73
- IMSI 11 12 6.42
- IMSI_11_12 4.111
- Info-Box 4.47
- Inputs/outputs
  - remote control 6.50
- Installation 1.1
- Installing software 1.2
- Interference 2.3
- IP address 4.116

L

- Levels
  - Gated output 4.45
  - Max output 4.44
  - Min output 4.42
  - Modulation, OEMP 6.124
  - OCNS 6.36
  - Overview 4.33, 4.35
  - Overview, MCQuality 6.52, 6.53
  - Power 4.50
  - Power min output 6.73
  - Power, code domain 4.71, 6.93
  - Power, gated output 6.87
  - Power, max output 6.80
  - Power, min output 6.72
  - Power, peak code domain error 4.75
  - Receiver quality 6.162, 6.163
  - Traffic channel 6.37
- Limit 6.21
  - Check 5.5
  - Lines 5.5
  - Specify 5.5
- Limit matching
  - Modulation 6.131
- Limit Matching
  - Bit field GOUT Power 6.92
  - Overview 6.63
  - Overview, channel quality 6.67
  - Power 6.75, 6.83
- Limits
  - Code domain power measurement, Signalling 4.87
  - Lines, gated output 4.51
  - Modulation 6.126, 6.127, 6.128
  - Modulation (NS) 6.18
  - Modulation measurement, signalling 4.68
  - Modulation, OEMP 6.123
  - Overview 4.37
  - Overview 6.60, 6.61
  - Power 4.51, 4.52
  - Power measurement 4.51
  - Receiver quality, confidence 6.164
  - Receiver quality, FER 6.164
  - Sensitivity measurement, signalling 4.97
- Limits (receiver quality)
  - Remote control 6.164
- List of Commands 6.166
- List of Signalling Commands 6.169
- Literal 5.8
- Loop back mode 4.89
- Loopback
  - Service option 6.26
- Loopback service 4.102

M

- Main power switch 2.2
- Maintenance 8.1
- Manual control 3.1
- Marker
  - Gated output 4.46
  - Signalling 4.39, 4.70
- Marker values 4.59
- Markers 4.118
- Max slot cycle index 6.44
- Max. frames
  - Receiver quality: 6.161
- Max. slot cycle index 4.112
- Maximum
  - Frame error rate 6.66
- Maximum FER limit 6.164
- Maximum output 4.43
  - AWGN 4.44
- Maximum output levels 4.44
- Maximum Output Levels 6.80, 6.81
- Maximum/Minimum 4.55, 4.86
- Maximum/Minimum (NS) 4.6
- MCC type 6.40, 6.41
- Measurement
  - Control 5.3
- Measurement groups 3.5
- Measurement object 5.7
- Menu select 2.4
- Menu structure 3.1
- Message monitor 4.116
- Messages, error 9.1
- Min protocol revision 6.42
- Minimum output 4.41
  - AWGN 4.42
- Minimum output levels 4.42
- Mobile country code
  - Mobile 4.111
  - Network 4.111
- Mobile ID 4.111
- Mobile phone
  - connection 2.2
- Modulation 6.16, 6.121, 6.134, 6.143, 6.152
  - Analyzer/Generator (NS) 4.5
  - AWGN 4.66
  - remote control 6.120
- MODulation
  - OEMP, impairments 6.125
  - OEMP, levels 6.124, 6.125
  - OEMP, limits 6.126, 6.128
- Modulation (NS)
  - Repetition 4.5
- Modulation Configuration
  - remote control 6.121
  - Remote control 6.134, 6.142
- Modulation configuration 4.65
- Modulation measurement 4.53
  - remote control 6.141
  - Remote control 6.120, 6.132, 6.150
  - Remote control (NS) 6.14
- Modulation measurement (control)
  - remote control 6.141

- Remote control 6.120, 6.132, 6.150
  - Remote control (NS) 6.14
- Modulation mode 6.6
- Modulation mode (NS) 4.13
- Modulation quality configuration
  - Remote control (NS) 6.16
- MS
  - MCC type 6.41
  - MSID type 6.41
- MS info 6.24, 6.25
  - Band class 6.25
  - Protocol revision 6.25
  - Subband class 6.25
  - Terminal 6.26
- MSID type 6.41, 6.43

N

- Narrow band
  - Expected power 6.12
  - Statistics 6.12
- Narrow Band Power 6.11, 6.46
- Network
  - BSID 6.42
  - IMSI 11 12 6.42
  - Max slot cycle index 4.112, 6.44
  - MCC type 6.40
  - Mini protocol revision 6.42
  - Paging channel rate 6.43
  - Protocol revision 6.42
  - Slot cycle index 4.112
  - System ID 6.41
  - Wildcard 6.43
- Network ID 4.111
- Network parameters 4.110
  - remote control 6.40
- Network standard 6.22
- Network standards
  - Remote control 6.22
- Networks supported 4.1, 4.23
- Networks Supported 1.1
- NID type 6.40
- Non-Signalling 3.2
- Non-Signalling measurements 2.7
- Notation
  - Remote control 5.7
- NPower 6.12
  - Control 6.48
  - Expected power 6.47
  - Repetition 6.13, 6.49
  - Report mode 6.46
  - Statistics 6.48
- NPOWer 6.11, 6.46

O

- OCNS
  - Base station signal 4.108
  - Level 6.36
  - Setting 6.36
- OCNS (NS) 4.12, 4.14, 6.4, 6.5
- OCNS settings 4.66, 6.36
- On limit failure 4.55, 4.90
- On limit failure (NS) 4.6
- Operating concept 3.1
- OPERation status register 5.6
- Origin parameter 4.101
- Out of Tolerance
  - Modulation 6.138, 6.147, 6.156
- Out of tolerance (NS) 4.8
- Output power 6.7
  - Base station signal 4.108
  - BS levels 6.35
- Output power (NS) 4.13
- Overview 6.57, 6.65
  - AWGN 4.34, 4.36
  - Remote control) 6.52
- Overview configuration 4.35
- Overview Meas. Configuration
  - remote control 6.66
  - Remote control 6.60
- Overview of the function group 4.32

P

- Packing 8.1
- Paging channel 6.38
- Paging Channel 6.43
- Paging channel rate 4.112, 6.43
- Paging channel slot cycle index 4.112, 6.43
- Paging level 6.8
  - BS signals 6.38
- Paging level (NS) 4.12, 4.13
- Parameter
  - Command 5.8
  - Current vs. default 6.23
- Pattern 6.29, 6.30
  - Loopback 4.103
- Pattern generation 6.29
  - Loopback 4.103
- Pattern generator 6.29, 6.30
- PCG count
  - Power 4.49
- PCG Count 6.86
- Peak code domain error
  - Levels 4.75
- Peak code domain error power 4.75
- Pilot level 6.8
  - Base station signal 4.108
  - BS levels 6.36
- Pilot level (NS) 4.12, 4.13
- Pilot power
  - Overview, MCQuality 6.54
- PN offset 4.109, 6.6, 6.38
- PN offset (NS) 4.15
- Power 6.48, 6.70, 6.77, 6.85, 6.106
  - remote control 6.68, 6.76, 6.84
- Power configuration 4.48
  - remote control 6.71, 6.79, 6.87
- Power control
  - Overview 4.36
- Power control bits 4.36
  - Modulation 6.15
  - Overview, MCQuality 6.54
- Power control bits (NS) 4.7
- Power measurements 4.38
  - Average values 4.41, 4.43
  - Current values 4.41, 4.43
  - Min/Max values 4.41, 4.43
  - Waveform quality 4.41, 4.43
- Power switch 2.3
- Primary service class 4.102
- Program example 7.1
- Protocol revision 4.110, 6.42
  - Minimum 4.110
- Pseudo measurement object 5.7

Q

- Q signal
  - CDPower 6.102, 6.103
- Q Signal Tolerance 6.111, 6.112

R

- Radio configuration
  - Loop 6.27
- Radio configuration, speech 6.30, 6.31
- Receiver quality
  - AWGN 4.91, 4.95
  - Max. frames 6.161
- Receiver Quality
  - Remote control 6.159
- Receiver quality configuration 4.94
- Receiver quality levels 6.162
- Receiver quality measurement 4.89
- Receiver quality measurement (control)
  - Signalling 4.94
- REF OUT 2 6.51
- Reference frequency 4.18
  - Remote control 6.51
  - Remote control (NS) 6.10
  - Signalling 4.115
- Reference line 4.119
- Registered 4.24
- Registration 6.44
  - Home 6.44
  - Methods 4.112
  - NID 6.44
  - Parameter 6.45
  - Power down 6.45
  - Power up 6.45
  - SID 6.44
- Rel. 1 4.118
- Rel. 2 4.118
- Remote control
  - basics 5.1
  - notation 5.7
  - Notation 5.7
  - Program example 7.1
- Remote Control
  - Commands 6.1
- Repetition 4.67, 4.85
  - Channel power 6.116
  - Modulation 6.123
  - Modulation (NS) 6.17
  - Modulation, EVM 6.135
  - Modulation, magnitude error 6.153
  - Modulation, phase error 6.144
  - NPower 6.13, 6.49
  - Overview 6.58
  - Overview, channel quality 6.65
  - Power 4.48, 6.71, 6.79, 6.100
  - Power, gated output 6.86
  - Power, min output 6.71
  - Power, peak code domain 6.107
  - Receiver quality 4.96
- Repetition mode 3.6, 5.4
- Report mode 6.11
  - NPower 6.46
- Reset 2.4, 2.5
- Result (Analyzer / Generator)
  - Non Signalling 4.7
- Result (CDPower)
  - remote control 6.101, 6.108
- Result (channel power)
  - Remote control 6.117
- Result (Modulation)
  - remote control 6.146
  - Remote control 6.130, 6.137, 6.155
  - Remote control (NS) 6.21
- Result (NPower)
  - remote control 6.13, 6.49
- Result (Overview)
  - remote control 6.63, 6.67
- Result (power)
  - Signalling 4.70
- Result (Power)
  - remote control 6.74, 6.82
  - Remote control 6.90
- Result (receiver quality)
  - Signalling 4.93
- Result (RXQuality – FER) 6.164
- Result mode
  - Modulation, EVM 6.134
  - Modulation, magnitude error 6.152
  - Modulation, phase error 6.144
  - Power, code domain channel 6.115
  - Power, code domain power 6.100
  - Power, gated output 6.85
  - Power, peak code domain 6.106
- Result order
  - Power, code domain 6.101
  - Power, peak code domain 6.107
- Results
  - Power 4.40
- RF channel
  - Generator 4.107
  - generator (NS) 4.11
- RF Channel
  - Generator (NS) 4.14
- RF channel (NS) 4.14
- RF connector 2.2
- RF connectors 2.3, 4.16, 4.114
- RF frequency 6.3, 6.5
- RF frequency (NS) 4.11
- RF generator 6.4
  - Remote control (NS) 6.4, 6.8
- RF input 4.17, 6.9, 6.50
- RF level, mode 6.1
- RF max. level 6.2
- RF max. level (NS) 4.10
- RF mode
  - Modulation (NS) 4.10
- RF output 4.16, 6.9, 6.50
- RFANalyzer
  - remote control (NS) 6.3

S

- Scope of Measurement 6.48
- SCPI standard 5.2
- Secondary address 5.6
- Service 4.26, 4.28, 4.30, 4.99
  - Loop 6.26
  - Speech 6.26
- Service cnfiguration
  - Menu 4.102
- Service configuration
  - Remote control 6.26
- Service option 0x8000 4.106
- Service option 1 4.105
- Service option 17 4.106
- Service option 2 4.103
- Service option 3 4.106
- Service option 9 4.104
- Service options 4.102
- Service otions 4.102
- Side band freq. offset
  - Modulation (NS) 4.6
- Sideband frequency offset
  - Modulation (NS) 6.18
- Signal off 4.24, 4.27, 4.29
- Signal on 4.24, 4.25, 4.99
- Signalling 3.2, 4.24

  - Remote control 6.23
- Signalling (signal on) 4.26
- Signalling action 6.23
- Signalling mode 5.1
- Signalling state 6.24
- Signalling symbols 3.3
- Singl shot
  - Modulation 4.54, 4.67
- Single shot 5.4
  - Modulation 4.85
  - Power 4.48
  - Receiver quality 4.90, 4.96
- Singleshot
  - Modulation (NS) 4.5
- Slot cycle index 4.112, 6.43
- Softkeys 3.4
- Software (enable) 1.7
- Special character 5.8
- Speech
  - Service option 6.30
- Speech service 4.105
- Standards supported 4.1
- Standby mode 2.3
- Startup menu 1.1, 2.4
- Statistic count 3.6, 4.56, 4.74, 4.78, 4.82, 4.86, 5.4
  - Channel power 6.115
  - Modulation (NS) 6.17
  - Modulation, EVM 6.135
  - Modulation, magnitude error 6.153
  - Modulation, overview 6.122
  - Modulation, phase error 6.143
  - Power 4.49
- Statistic Count
  - Overview, channel quality ... 6.70, 6.78, 6.99, 6.106, 6.107
  - Overview, overview 6.58
  - Power, gated output 6.85
- Statistic count (NS) 4.8
- Statistic counts
  - Modulation (NS) 4.6
- Statistics
  - NPower 6.12, 6.48
  - Power, min output 6.70
  - Remote control 5.3
- STATus
  - OPERation register 5.6
- Status indication 2.8
- Status reporting system 5.5
- Step mode
  - Power, min output 6.71
- Stepping mode
  - Channel power 6.116
  - Modulation (NS) 6.17
  - Modulation, EVM 6.135
  - Modulation, magnitude error 6.153
  - Modulation, overview 6.123
  - Modulation, phase error 6.144
  - Overview 6.58
  - Overview, channel quality 6.65
  - Power 6.71, 6.79, 6.100
  - Power, gated output 6.86
  - Power, peak code domain 6.107
- Stop condition 3.6, 4.55, 4.68, 4.85, 4.90, 4.96
  - Channel power 6.116
  - Modulation (NS) 6.17
  - Modulation, EVM 6.135
  - Modulation, magnitude error 6.153
  - Modulation, overview 6.123
  - Modulation, phase error 6.144
  - Overview 6.58
  - Overview, channel quality 6.65
  - Power 4.49, 6.71, 6.79, 6.100
  - Power, gated output 6.86
  - Power, min output 6.71
  - Power, peak code domain 6.107
- Stop condition (NS) 4.6
- Storing 8.1
- Subarrays
  - Modulation 6.136, 6.145, 6.154
  - Power 6.89
- Subnet mask 4.116
- Sync level 6.7
  - Base station signal 4.108
  - BS levels 6.35
- Sync level (NS) 4.12, 4.13
- Synchronization
  - Remote control (NS) 6.10
- Synchronized 4.24
- System ID 4.110, 6.41
- System parameters 6.41

T

- Target list 6.39
- Test modes 3.2
- Test name 4.94
- Test setup
  - Receiver quality 6.159
- Tests
  - Non-Signalling 4.3
  - Signalling 4.22
- Trace 5.4
- Traffic channel 6.5
  - BS signal 6.37
  - Level 6.37
- Traffic channel (NS) 4.14
- Transmit time error (NS) 4.8
- Trigger source 6.2
- Trigger source (NS) 4.21
- Triggering
  - External 4.20, 4.116
  - Signalling 4.116
- Triggering (NS) 4.20

U

- Updating software 1.2
- User guidance 4.117

W

- Waveform quality
  - Modulation 4.60
  - Overview 6.60, 6.61, 6.62
  - Power, max output 6.82
  - Power, min output 4.52, 6.74
- Waveform quality (NS) 4.7
- Wildcard 4.111, 6.43

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